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# Unusual Storage Arrangement Features This Quarrying and Crushing Operation

## Watauga Stone Co., Watauga, Tenn., Also Finds Truck Operation in Quarry Economical

ONE OF THE newer quarrying operations in eastern Tennessee is that of the Watauga Stone Co. at Watauga, Tenn. Although the plant is not large, it has many of the most modern features and has proved to be an efficient producing unit. Among these features are the use of truck transportation in the quarry and the unusual reclaiming arrangement for the stored material.

The crushing and screening plant is located only slightly above the quarry floor, quarrying being done in the side of a hill, so that the operation lends itself readily to truck transportation between quarry and primary crusher. The stone is a well stratified limestone which the company has found can be worked best in benches of 12 to 15 ft. instead of drilling the whole depth at one time. The total height of face is about 65 ft.

For this work air drills have been found quicker and more efficient than other types and Chicago Pneumatic hand drills are used. The holes are spaced 10 ft. back from the face and 6 ft. apart and about 30 holes are included in a shot with approximately 10 lb. of dynamite to each hole.

Very little stripping is necessary and this is done by hand as the surface of the stone is irregular and contains clay pockets which are best removed by pick and shovel.

The stone in the quarry is loaded with a 1¼-yd. Lorain steam shovel. A Mack truck equipped with a 10-ton Easton side-dump body is used to transport the rock to the plant. So far only one truck is used but another will be added as soon as increased business warrants. Although the plant was designed for a daily output of about 800 tons, this figure is not reached with one truck in operation. The operators have found that truck transportation in the quarry is particularly desirable because it obviates the necessity of frequent track shifting.

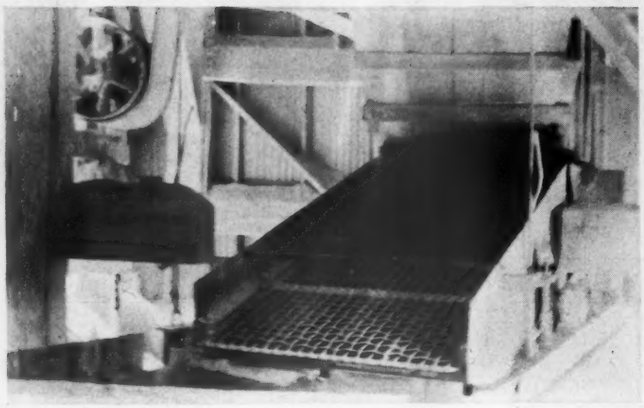
The truck travels up a short ramp to the top of the gyratory crusher and is dumped directly into it. One advantage of the side-dump body is that no backing or maneuvering of the truck is necessary and after the load has been dumped the truck can go straight on down the other ramp without loss of time. Alongside the dumping platform is a timber frame containing a Curtis air hoist equipped with a cable and hook for dumping the truck.

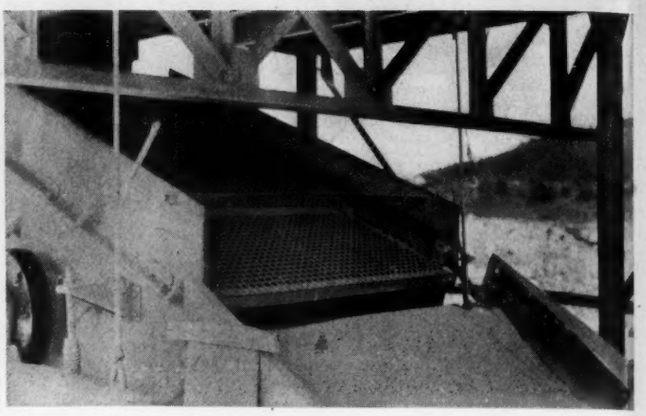
The primary crusher is a No. 8 Gates gyratory crusher which is driven by a 100 hp. General Electric motor through a Texrope drive. The crusher discharge falls directly to a 24-in. Stephens-Adamson belt conveyor and is carried up to the scalping screen in the building housing the secondary crushing equipment. This conveyor is driven at the head end by a 25-hp. General Electric motor through a Falk speed reducer. The conveyor discharges to a 5- by 8-ft. Stephens-Adamson single-deck vibrating scalping screen which is driven by a 7½-hp. Westinghouse squirrel-cage motor through a Dayton Cog-Belt drive.

The oversize from the scalping screen is chuted to a gyratory crusher for secondary breaking, the discharge from the crusher falling to a return conveyor and being carried up to the main conveyor feeding the scalping screen. This screen and the secondary crusher are thus in closed circuit so that no oversize stone can get to the sizing screen. The throughs from the scalping screen fall to a 20-in. Stephens-Adamson belt conveyor and are taken to the sizing screen. This conveyor is driven by a 25-hp. General Electric motor through a Falk speed reducer.

The company does not use the conventional bins for its sized material, but instead stockpiles the sized stone below a central screening tower. This tower is of structural steel and is about 40 ft. in height. The roof is of corrugated iron and part of the top floor is

*General view of quarry in which trucks are used*





*Single-deck vibrating scalping screen, at left, and triple-deck sizing screen*

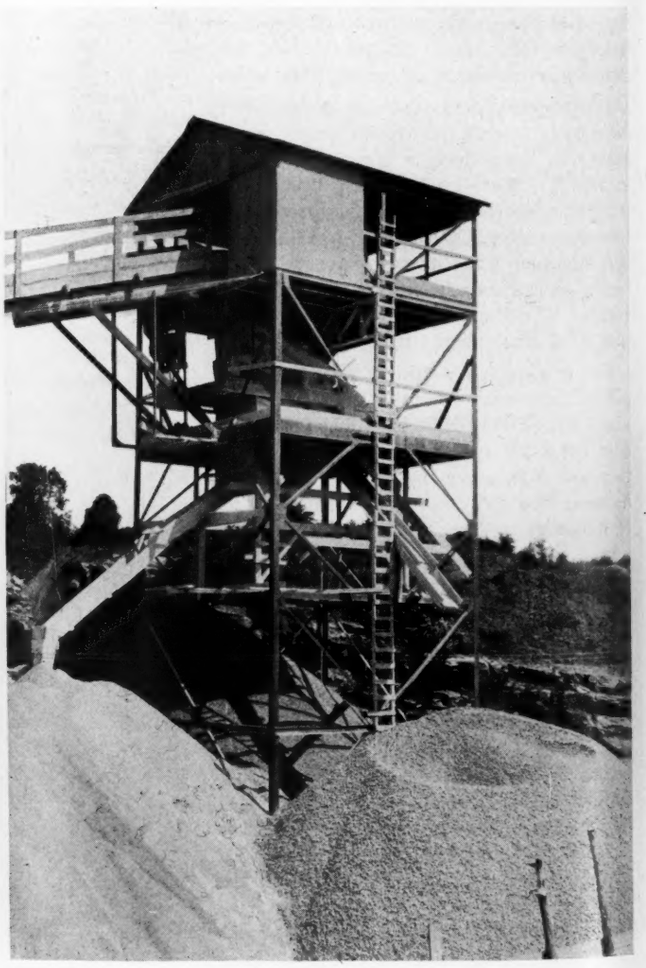
enclosed with corrugated iron to protect the motor and speed reducer driving the conveyor. The screen floor and the floor below are not enclosed. This is an advantage in handling the chutes to the different stock piles and in the production of a cleaner and more dustless product, as the winds from the Tennessee hills blow the dust away as the material is being screened.

A 5- by 8-ft. triple-deck Stephens-Adamson vibrating screen driven by a 10-hp. Westinghouse motor through a Dayton Cog-Belt drive is used for sizing the material. The conveyor discharges direct to the screen and four sizes are taken from it. The oversize from the top deck is 1⅛ to 2 in. in size and is chuted to one of the stock piles below. The stone passing over the second deck is ¾ to 1⅛ in. in size and that passing over the third deck is ¼ to ¾ in. in size. The material passing through the bottom deck is minus ¼ in. in size. Each size is chuted to a separate pile.

Below the screening tower and stock piles are concrete reclaiming tunnels, the steel frame of the tower being supported on this concrete structure. The main tunnel directly under the longer axis of the tower extends from a point east of the tower to the discharge end beyond the west side of the tower. In this tunnel is a 24-in. Stephens-Adamson belt conveyor which is driven by a 10-hp. General Electric motor through a small Falk speed reducer.

A second tunnel crossing the first at right angles to it contains two short 24-in. belt

*Quarry truck at dumping point at primary crusher*



*Screening tower around which are the storage piles*

conveyors, each driven by a 5-hp. General Electric motor through a small Falk speed reducer. The two short conveyors discharge to the longer conveyor at the tunnel intersection and all material is delivered by it to another conveyor carrying up to the loading hoppers.

There are four gates in each of the four arms of the tunnel system, each of these sixteen gates discharging into its own large wooden box directly above the belt. These boxes act as "dead beds" for the stone so that it falls upon stone already in the box and rolls down a short chute to the conveyor, reducing wear on both belt and chute.

This saving is a considerable factor in a crushed stone operation where the sharp edges of the rock tend to wear out the belts in a comparatively short time. At this plant such boxes or shelves have been put in the chutes above the screens and conveyors to reduce wear to a minimum.

The flow of stone from the gates is regulated by placing a pin in one of a number of holes along the upper edge of each box and then opening the gate until the handle rests against the pin. Shifting the pin changes the opening of the gate and the consequent flow of material. The setting for any given mix is found by sieve analysis of the mixture and trial runs until the correct percentages are obtained. After that the desired mix is obtained by setting the pins in the previously determined holes.

The storage piles have a capacity of about 6000 yd. which has been sufficient for present needs, but more storage capacity could easily be obtained by the installation of a drag scraper system.

### *Loading and Washing Equipment*

The long conveyor of the tunnel system discharges the reclaimed material to a 24-in. Stephens-Adamson belt conveyor which carries the stone to the top of the washing and loading unit. This conveyor is driven by a 25-hp. General Electric motor through a Falk speed reducer.

***Scalping and recrushing building, with return conveyor***

The loading unit is a wooden structure built over a railroad siding. Stone delivered to the top of this unit may be chuted to the washing equipment, to the bin for unwashed shipment by rail, or to a bin beside the main structure for unwashed shipment by truck.

A large percentage of the stone is washed, as it goes for state highway concrete construction and the state requires washed stone. The washing equipment consists of a Stephens-Adamson Gilbert-type conical screen having a jacket for the removal of fines. This screen is not intended for sizing but only for the complete removal of all dust.

The plant has an interesting system for supplying water for washing and for fire protection. The stream from which the water is pumped is several hundred feet from the plant and two pumps, located in a pump house alongside the stream, are used. One of these is a Fairbanks-Morse centrifugal pump which furnishes water for washing. The other is a Worthington Triplex plunger pump which is used to supply water for fire protection and other uses around the plant. This pump supplies water to a large tank located on the hill above the plant from which it is drawn by gravity as needed.

A number of "hydrants" have been placed in the line so that water is available at points adjacent to the plant buildings. The outlets are several feet above the ground and the valves are enclosed in wooden boxes filled with sawdust or limestone dust to prevent freezing in winter. A check valve is installed near the creek to prevent the water from flowing back through the pump and a connection permits using this water to prime the centrifugal pump.

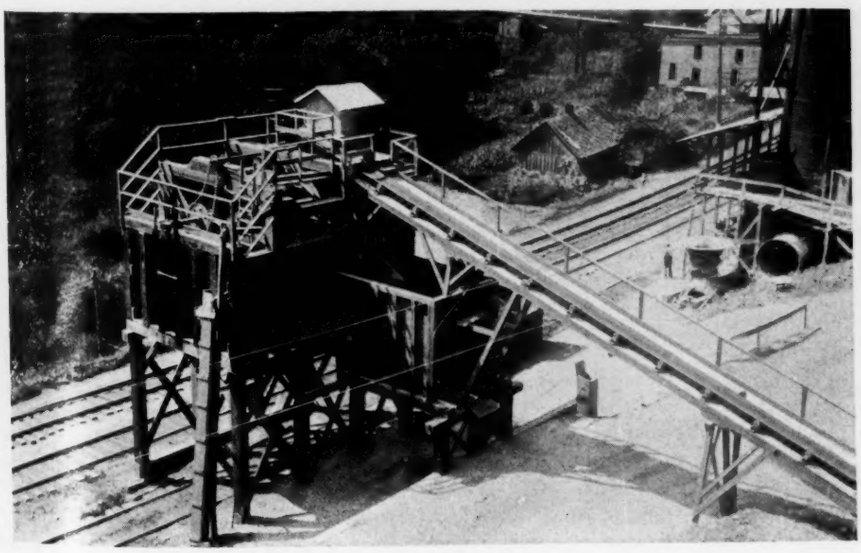
The tank also supplies water for cooling the air compressor. This cooling water, after passing the compressor, flows on to another tank at the edge of the quarry, from which it flows by gravity to supply the steam shovel in the quarry.

The shop equipment includes an Ingersoll-Rand drill sharpener and air compressor of 750 C.F.M. capacity, which is driven by a 100-hp. General Electric motor.

Switching of cars is done by a 20-ton Porter steam locomotive. Most of the stone shipped from the plant goes by rail, though there is some truck shipment. The plant gets out ballast stone and has been doing quite a bit of this work during the past few months.

The plant was built two years ago, beginning operations in July, 1930, but has been so well kept up that it has the appearance of having just been completed. The engineering on the plant shows careful thought toward avoiding all "lost motion" and has resulted in an efficient operation.

The company has its main offices at Knoxville, Tenn. H. I. Young is president and Robert S. Campbell is vice-president and general manager; W. H. McCroskey is treasurer and J. M. Pirkey is superintendent.



***Loading hoppers and washing unit fed from storage piles***

# Clay Mining Methods and Costs at the Corunna, Mich., Pit of the Aetna Portland Cement Co.*

By Oliver A. Dibble†
General Superintendent, Aetna Portland Cement Co.

THIS PAPER is one of a series describing mining methods and costs at clay pits and designed to disseminate technical information regarding the methods used. The cost tabulations represent operating expenditures only and not total costs.

The open-pit recovery of clay for cement plants is a comparatively simple operation in comparison with underground mining of clays; nevertheless, it represents an appreciable factor in the cost of cement manufacture.

This report deals with the methods employed by the Aetna Portland Cement Co., which operates cement mills at Fenton and Bay City, Mich., in recovering clay from its pit at Corunna, Mich., on the Grand Trunk Western railway.

### History

In 1903 the Aetna Portland Cement Co. started its cement mill at Fenton, Mich., and at that time opened the Corunna clay pit. Almost simultaneously the Hecla Portland Cement Co. of Bay City, Mich., and the Egyptian Portland Cement Co. of Fenton started operation, opening other portions of the Corunna clay deposit. The clay rights were purchased from the Corunna Coal Co. on the northwest 40 acres of the tract (Fig. 1) by the Aetna Portland Cement Co. and on the northeast 40 acres by the Egyptian Portland Cement Co.

The early digging of clay was interesting because of its crudeness. The stripping was let on contract to a man with a ½ cu. yd. stiff-arm Vulcan shovel. About half an acre was stripped to a depth of 3 ft. in two months. The contract for loading clay was let to a group of teamsters, and the digging was done with slip scrapers; these were drawn to a small trestle and dumped into narrow-gage cars. These cars were then pulled by teams up another trestle where they were dumped into flat cars with 10-in. sides and no end gates. These cars held from 15 to 18 tons. The property was operated in this way during the first summer. The next year, however, the slip scrapers were replaced by the previously mentioned Vulcan shovel. This shovel was so handicapped in its work because it could not swing, that it was abandoned in the following year, 1905. The procedure then adopted was to use teams with wheel scrapers to dig and haul the clay up a trestle, and to dump the load by hand into railroad cars on the track below. These cars differed from the others only in that they had 24-in. sides. With this plan, 13-wheel-scraper teams and two plow teams could load twelve 30-ton cars daily.

In 1906 the Hecla Portland Cement Co. moved its clay operations to a pit near Bay City, leaving only the Egyptian Portland Cement Co. and Aetna Portland Cement Co. digging at Corunna. These companies continued the slip-scraper plan of digging at a contract price of $0.24 per ton from 1905 to 1916.

In 1916 the Aetna Portland Cement Co. cancelled its digging contracts and purchased a ⅝-yd. full circle swing, 4-wheel, traction-type shovel fitted with a 12-ft. boom. This shovel with eight men loaded five 40-ton cars in a 10-hr. day. In 1919 the Egyptian Portland Cement Co. bought a ⅝-yd. shovel and followed the Aetna plan of digging. In 1923 the Bay City cement mill of the Aetna Portland Cement Co. started operations, which required an increased clay production. About that time the Egyptian Portland Cement Co. purchased a 1-yd. full-circle swing, 4-wheel, traction-type shovel fitted with a 20-ft. boom and sold the old shovel to the Aetna Portland Cement Co. to care for the extra tonnage required. In 1927 the Egyptian Portland Cement Co. discontinued operations at Fenton and the Aetna Portland Cement Co. bought its 1-yd. shovel and all its clay rights. Two years later the Aetna Portland Cement Co. purchased the Rose farm which adjoins its other property on the south (Fig. 1) and in the summer of 1930 started digging from this deposit. In addition to this property the company owns 80 acres containing approximately 2,000,000 cu. yd. of high-grade clay near Midland, Mich., on the Pere Marquette Railway. This is to be opened for use at the Bay City plant in the near future.

### Physical Characteristics of the Deposit

The Corunna pit comprises approximately 100 acres, of which 80 have been dug over to an average depth of 12 ft. The remaining 20 acres are estimated to contain 380,000 cu. yd. of available material, averaging 15% sand.

Those sections of the deposit which were first worked were low in sand. The last deposit (Rose farm), however, contains considerable sand, and consequently the material is more difficult to grind to the required fineness. There is no definite stratification to the clay and on this particular deposit there is practically no overburden. The little overburden is a clayey soil which mixes well with the clay and causes no difficulty. Occasionally pockets of sand and gravel are found in the clay.

Due to these pockets, accurate sampling is difficult and the results are not always representative. However, test holes give a fair idea as to the location of available material, and they are put down every 50 ft. for each shovel cut. Two men with an auger can sink an average of five holes in 10 hr. The cement-plant laboratories run the samples during spare time. One man can run approximately 20 samples in a 10-hr. day.

Sand content is an important factor, due to its high resistance to grinding, as fine preliminary grinding is essential to good burning.

The determination of sand in the clay is made from samples taken as follows: the auger is sunk about 6 in. at a time and then pulled, and a small sample is taken from each inch of the auger and placed in a bag. Separate bags are used for the material from each 5 ft. of hole; if a definite change in the deposit is observed at any time, a new sample bag is used, and the depth at which the change occurred is noted.

The samples are then sent to the laboratory, dried, ground and a 100-gram sample is washed through a 100-mesh sieve. The oversize is dried and weighed, the weight being the percentage of sand in the clay.

### Mining and Transportation

The clay is dug in a single bench by two steam shovels which load directly to railroad cars. The shovel cuts are approximately 50 ft. wide and 10 to 20 ft. deep, averaging about 12 ft. The larger shovel takes a full 50-ft. cut, while the small one takes about 40 ft. The cut now being made is approximately 500 ft. long, and the two shovels load from 450 to 500 tons per day.

The pit is worked 10 hours a day with two shovels and an average crew of eight men. The actual digging does not begin until 8:30 or 9 a. m., as steam has to be raised in the shovel boilers. During this delay the men are employed in track maintenance.

*Abstracted from U. S. Bureau of Mines Information Circular 6657.

†One of the consulting engineers, U. S. Bureau of Mines.

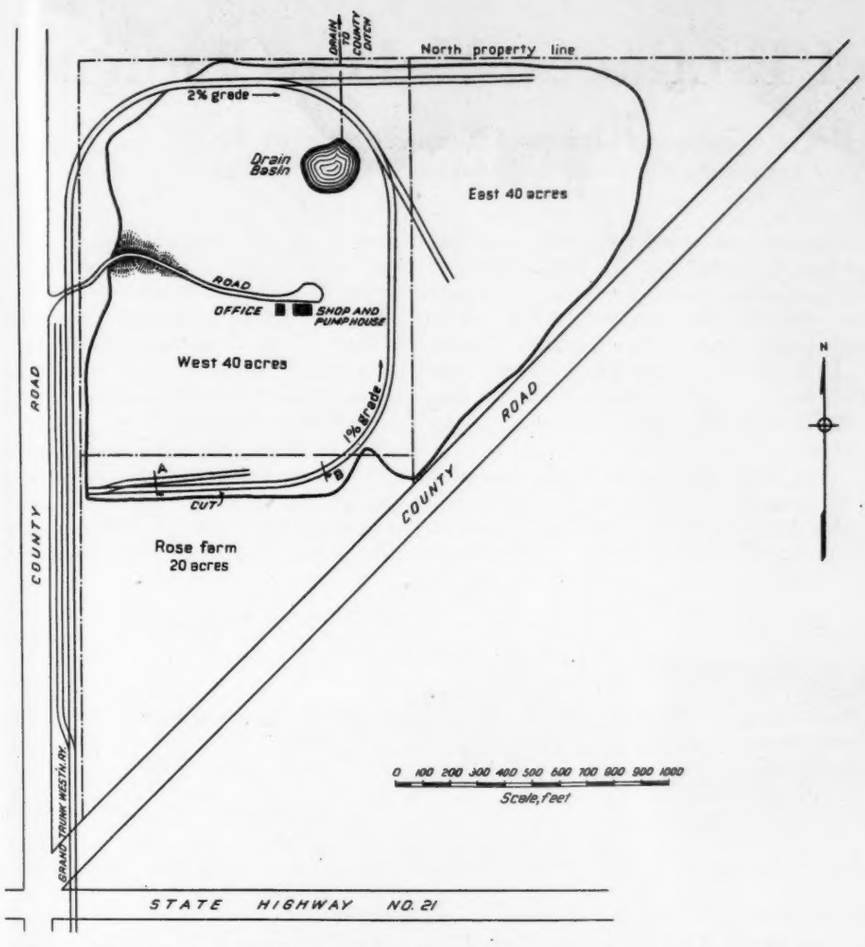



***Fig. 1. Map of clay property of Aetna Portland Cement Co. at Corunna, Mich.***

TABLE II. SHOVEL-OPERATING COSTS AT CORUNNA PIT

Period, February 15 to December 15, 1931; 1-cu. yd. Type A Shovel; Material handled: Overburden, 5000 tons; Clay, 68,750 tons.

| | Clay | | Overburden | | |
|---|---|---|---|---|---|
| | Amount | Cost per ton | Amount | Cost per ton | Total cost per ton clay |
| Engineers | $ 502.00 | $0.0073 | $100.00 | $0.020 | $0.0088 |
| Firemen | 449.00 | 0.0065 | 90.00 | 0.018 | 0.0078 |
| Pitmen | 669.00 | 0.0097 | 74.00 | 0.015 | 0.0108 |
| Foremen | 403.00 | 0.0059 | 80.00 | 0.016 | 0.0070 |
| Fuel | 145.00 | 0.0021 | 30.00 | 0.006 | 0.0025 |
| Repairs | 290.00 | 0.0042 | 60.00 | 0.012 | 0.0051 |
| Total | $2,458.00 | $0.0357 | $434.00 | $0.087 | $0.0420 |

⅝-cu. yd. Type O Shovel; Material handled: Overburden, 10,000 tons; Clay, 43,750 tons.

| | Clay | | Overburden | | |
|---|---|---|---|---|---|
| | Amount | Cost per ton | Amount | Cost per ton | Total cost per ton clay |
| Engineers | $ 274.00 | $0.0053 | $ 91.00 | $0.0091 | $0.0083 |
| Firemen | 235.00 | 0.0054 | 78.00 | 0.0078 | 0.0072 |
| Pitmen | 337.50 | 0.0077 | 112.50 | 0.0112 | 0.0103 |
| Foremen | 219.50 | 0.0050 | 73.50 | 0.0074 | 0.0067 |
| Fuel | 94.70 | 0.0022 | 32.80 | 0.0033 | 0.0029 |
| Repairs | 159.00 | 0.0036 | 53.00 | 0.0053 | 0.0048 |
| Total | $1,319.70 | $0.0302 | $440.80 | $0.0441 | $0.0402 |

Note: The above tables cover cost during actual digging time only, and do not include maintenance labor.

The large shovel with the 1-yd. dipper can load a 50-ton car in 25 minutes and the smaller shovel with the ⅝-yd. dipper can load a car in one hour.

The requirements of the two cement mills do not demand the total capacity of both shovels. The present cut is high in sand at one end and low at the other. The Bay City mill can use the clay with the higher sand content, but the Fenton mill can not; hence the two shovels are used to dig the different types of clay for the respective mills. A beneficial change could be made by using a ¾-yd. dipper on the 1-yd. shovel. The clay is hard to dig due to its cohesiveness, and the use of an overpowered shovel would materially lengthen its life while not appreciably decreasing production.

The railroad switch engine places the empties and takes out the loaded cars about 7 a. m. If the cut is short the engine switches the empty cars to the siding on the upper grade of the track, which is on the south side of the pit (A, Fig. 1), and as cars are required they are switched out with the shovel winches. Track moving is necessary every three months. It delays mining and is a costly operation, especially in wet weather, while in dry weather it means a delay of 1½ days with little extra cost.

When a cut is completed all cars are switched out, all waste is thrown out of the way and the track is cut in two places, at A and B (Fig. 1). The track is pulled into the new position and ties and rails laid to connect it with the unmoved track. In dry weather cinders are then tamped around the ties for ballast, but in wet weather the cinders must be laid first and a larger crew is necessary. Moving and preparing the track for temporary use takes about two days of 10 hours each, and an average of about 100-man-hours is required in addition to bring the track to standard condition. This additional work is done by the regular operating crew during spare time.

The foreman is paid $175 per month, the two engineers 45 c. and 50 c. per hr., and the two firemen and three laborers 40 c. per hr.

TABLE I. CLAY-PIT COSTS AT CORUNNA PIT

Period, February 15 to December 15, 1931. Tonnage excavated 112,550.

| | Man-hours | Payroll | Cost per ton |
|---|---|---|---|
| Labor, operation: | | | |
| Supervision | 2,300 | $1,548.00 | $0.0138 |
| Engineer | 4,320 | 1,944.00 | 0.0173 |
| Firemen | 4,320 | 1,728.00 | 0.0153 |
| Pitmen | 6,040 | 2,416.00 | 0.0215 |
| | 16,980 | $7,636.00 | $0.0679 |
| Labor, track moving: | | | |
| Supervision | 100 | $ 67.30 | $0.0006 |
| Labor | 920 | 379.50 | 0.0034 |
| Tractor and driver | 150 | 150.00 | 0.0013 |
| | 1,170 | $ 596.80 | $0.0053 |
| Labor, track maintenance: | | | |
| Supervision | 200 | $ 134.70 | $0.0011 |
| Labor | 2,600 | 1,072.50 | 0.0095 |
| | 2,800 | $1,207.20 | $0.0106 |
| Labor, total | 20,950 | 9,440.00 | 0.0838 |
| Material: | | | |
| Coal, tons | 150 | $ 637.50 | $0.0057 |
| Repairs* | ..... | 1,122.30 | 0.0100 |
| | | $1,759.80 | $0.0157 |

TOTAL COSTS

| | Man-hours | Cost | Cost per ton |
|---|---|---|---|
| Labor: | | | |
| Operating | 16,980 | $ 7,636.00 | $0.0679 |
| Track moving | 1,170 | 596.80 | 0.0053 |
| Track maintenance | 2,800 | 1,207.20 | 0.0106 |
| Material: | | | |
| Coal | ..... | 637.50 | 0.0057 |
| Repairs | ..... | 1,122.30 | 0.0100 |
| Team: | ..... | 650.00 | 0.0057 |
| Total | 20,950 | $11,849.80 | $0.1052 |

Total man-hours per ton 0.1862.

*Track, ties and rails, etc., included in this item.

## Refractory Clays in Canada

A SUMMARY of what is known of refractory clays of Canada has been made by the Department of Mines, Ottawa, in which deposits in each province of the Dominion are reported and characteristics described.

# Illinois Gravel Producer Makes Changes

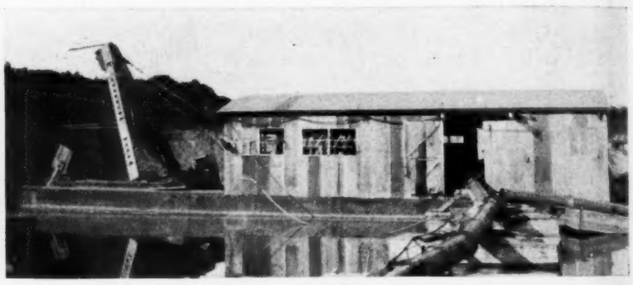
## Kingston Lake Gravel Company Installs Pump Dredge at Its Mapleton Plant and Improves Facilities for Making Clean Product

THE Kingston Lake Gravel Co., of Mapleton, Ill., which completed a new plant near there last season, has recently made extensive changes in the plant to increase its capacity. The greatest change was in the installation of a dredge boat and pumping unit to replace the cableway excavator which was used last season. The new unit has a 15-in. pump, furnished by the American Manganese Steel Co.

A second change was the installation of a 4-ft. by 8-ft. Simplicity vibrating screen directly below the grizzly which receives the pump discharge at the top of the plant. Between the grizzly and the new vibrator a 1¼-in. inclined stationary screen was placed so that only the sand and smaller gravel reach the vibrator. The particular purpose of the vibrating screen was to dewater the material and remove the fine sand. No particular change was made in the sizing of the gravel.

The flow of the material through the plant is shown in the accompanying flow sheet. The dredged material is discharged over a grizzly, the oversize falling directly to a crusher and the throughs being dewatered and falling to a bin from which they are carried by a belt conveyor to a revolving screen for further preliminary sizing. This material is fed to the belt conveyor by a reciprocating pan feeder which is interesting as having perforated bottom and sides to permit further dewatering.

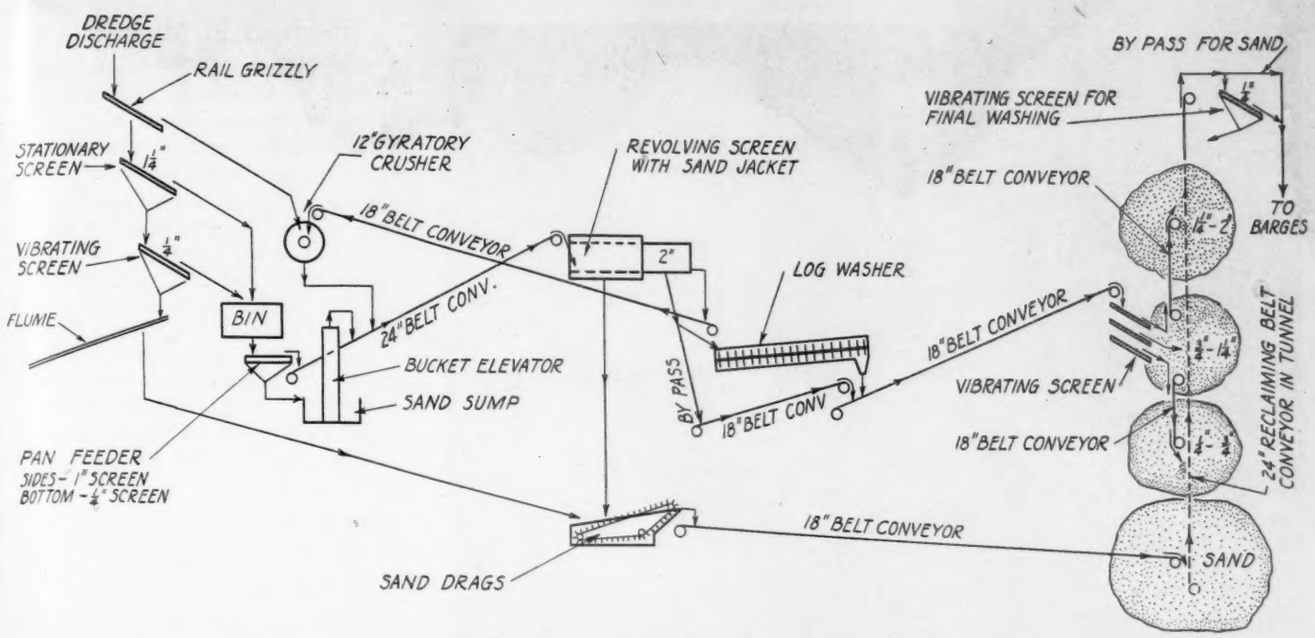
The revolving screen has screen sections with 2-in. perforations and a sand jacket. The sand passing through this jacket, as well as that from the preliminary vibrating screen, goes to two sand drags, from which it is



*Steamer "Calvin B. Beach" and barges and, at right, new pump dredge*

*Conveyor system above storage piles and, at right, reclaiming conveyor and barge loading facilities*

*Main conveyor from log washer to storage piles and, at right, sand piling conveyor from drags*

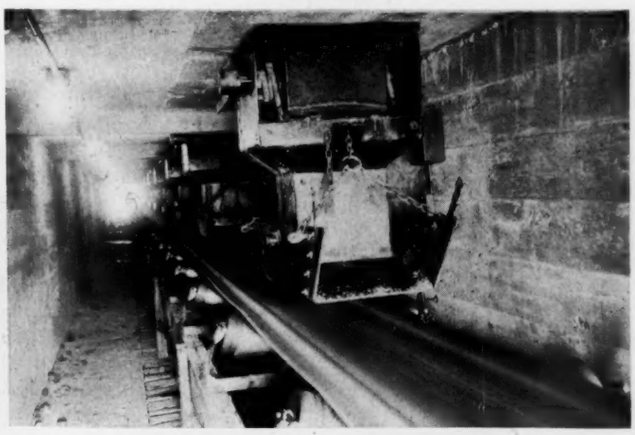


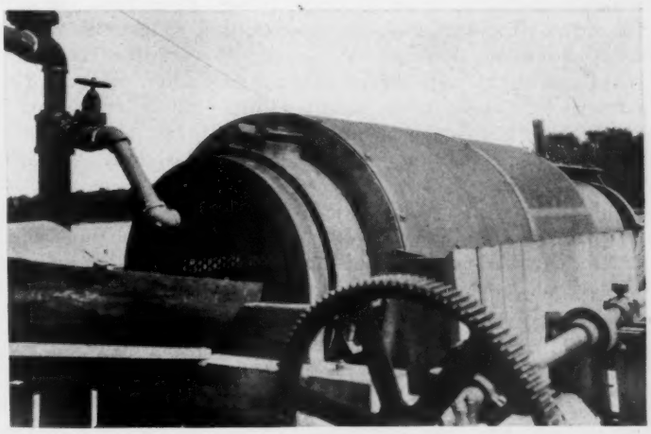

***Flow sheet of Kingston Lake Gravel Co., Mapleton, Ill.***

carried by an inclined belt conveyor to the sand storage.

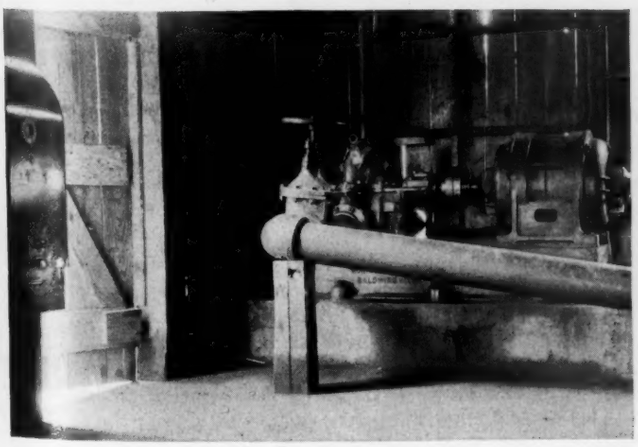
The minus 2-in. material falls to a 24-ft. McLanahan double log washer from which it is carried by an inclined belt conveyor to the final sizing screen over the storage piles. Arrangements are also made to by-pass this material around the log washer. Oversize from the revolving screen is returned on a belt conveyor to the 12-in. gyratory crusher, which is thus in closed circuit with the screen.

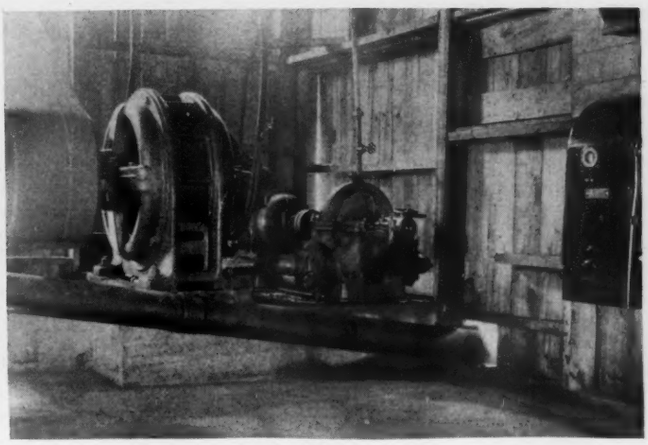
Final sizing is done over a 4-ft. by 8-ft. triple deck Niagara vibrating screen. The oversize from the top deck and the oversize



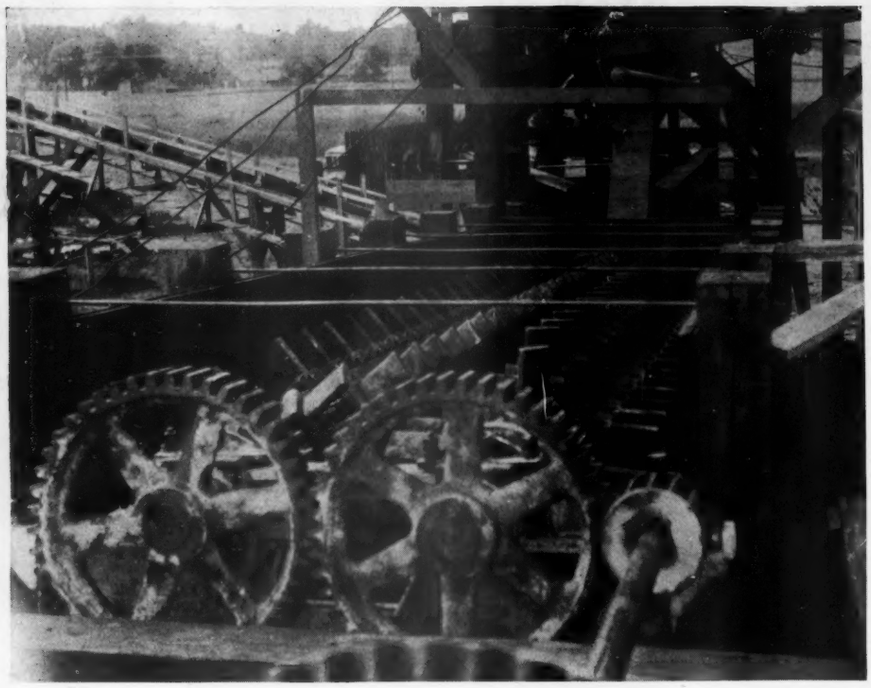


***At left, conveyor and feed gates in reclaiming tunnel, and, at right, revolving screen***





***Pump unit for wash water, at left, and motor driving log washer***



*Log washer for washing of gravel*

from the bottom deck fall to two short belt conveyors which extend out to form the ¼- by ¾-in. and the 1¼- by 2-in. piles, while the ¾- by 1¼-in. pile is formed below the screen. The fines from the lower deck are spouted to one side.

The gravel and sand storage piles are in a row at right angles to the main belt from the washing and screening plant and are separated from each other by concrete walls.

Under the piles a 24-in. belt conveyor in a 6- by 8-ft. concrete tunnel is used for reclaiming the material from the piles and also serves as a mixing belt. At the loading point the material is passed over a 3-ft. by 6-ft. single-deck Niagara vibrating screen with ¼-in. mesh cloth for a final rinsing as it is being loaded into barges. The sand is bypassed over this screen.

It will be noted that unusual arrangements have been made in the way of dewatering and washing to insure a clean product. The plant is also interesting in that it has been kept close to the ground.

The log washer is driven by a 100-hp. General Electric induction motor and the main 24-in. belt conveyor and revolving screen by a 40-hp. Fairbanks-Morse motor. Water for washing is delivered to the log washer and revolving screen by a 6-in. Morris centrifugal pump and to the preliminary and rinsing screens by a 4-in. Fairbanks-Morse centrifugal pump. These are driven by 50-hp. and 25-hp. General Electric motors.

When the plant was built a year ago it was owned by the Cast Stone Construction Co. of Bloomington. Later the present company was organized to take over all the producing end of the Cast Stone company's business, and that company continued exclusively as road and paving contractors. The same men are officers in both companies: George N. Childs being president; W. S. Kelley, vice-president and treasurer, and R. S. Solem, secretary.

The distribution of the products of the Kingston Lake Gravel Co. is entirely by water. Kingston Lake is an arm of the Illinois river, so that it is possible to deliver direct to the many cities and towns along this river. The Kingston company owns a large river steamboat, the *Calvin B. Beach,* which is used for moving its large fleet of barges. The company this year has added considerably to its equipment by putting in service ten new barges, each with a capacity of 500 tons. It has also rebuilt and improved many of its older barges.

## Reports on Potash Deposits of Wyoming and New Jersey

ENOUGH POTASH lies in the rock deposits of Wyoming and greensand deposits of New Jersey to make the United States independent of any foreign supply of this fertilizer, according to the Department of Agriculture. This potash needs only commercially profitable methods of extraction to make it readily available to the American farmer. Experimental blast furnace trials by the department has shown that the Wyoming rock will yield 10 to 11% potash and the New Jersey greensand from 5 to 7%. Cheap fuel in Wyoming should make possible a commercial furnace plant there that could produce potash to compete with other potash on the market, the department believes. The Wyoming potash is easier to extract than that from the greensand, but it is farther from the fertilizer market.—*New York* (N. Y.) *Journal of Commerce.*

## Feldspar in Minnesota

A REPORT on the geology and development of Minnesota's nonmetallic mineral resources made by G. A. Thiel and G. M. Schwartz contains some interesting data on feldspar in that territory.

Deposits of plagioclase feldspar or anorthosite, some of remarkable purity, are very abundant along the north shore of Lake Superior in Lake and Cook counties. At an early date quarries were opened at Split Rock and Crystal Bay, apparently with the mistaken idea that the material was carborundum. These ventures were unsuccessful and the quarries were closed. Experiments designed to find uses for this material have been carried out, but thus far they have not been successful.

Recently deposits of high-grade feldspar have been opened on the small part of Minnesota in the Lake of the Woods, known as the Northwest Angle. The mine is on a pegmatite in a ridge consisting mostly of Keewatin greenstone. The belt of pegmatites is over one-quarter of a mile long and about 600 ft. wide and consists of overlapping lenses. The feldspar is slightly pinkish and consists of an intergrowth of potash and soda feldspars. The material is of high grade and a mill has been built at Warroad to grind the material for marketing.—*Ceramic Age.*

## Canadian Cement and Lime Production in June

PORTLAND CEMENT production in Canada reached a total of 566,992 bbl. in June, states a report just issued by the Dominion Bureau of Statistics. During May, 530,504 bbl. were produced, and in June, 1931, the production was 1,242,864 bbl.

Canada exported 1868 bbl. of portland cement valued at $1708 in June; during the preceding month, 5941 bbl. worth $5108 were exported. Importations of portland cement rose 9.6% as compared with the May total.

Canadian lime producers shipped 27,290 tons of lime during June, in the previous month shipments totaled 30,014 tons, and in June a year ago, 30,956 tons were produced During the six months ending June, 1932, shipments of lime amounted to 160,473 tons as compared with 172,126 tons in the first half of 1931.

## Book on Magnesite

"MAGNESITE and Its Processing" is the title of a book recently published by Dipl.-Ing. R. Banco of Essen (Ruhr), Germany. It covers the subject of magnesite from raw material through the various manufacturing processes, including many illustrations. Titles of the various chapters give a good idea of the contents of the book. They are: Raw Magnesite; Caustic Calcined Magnesite; Sinter Magnesite; Magnesite Products; Micro-structure of Magnesite Products.

# Proposed New Federal Specifications for Concrete Aggregates

THE FEDERAL SPECIFICATIONS BOARD is adopting and promulgating purchase specifications for commercial commodities purchased by the various departments and establishments of the United States Government.

These concrete aggregate specifications, in the formative stage, are being submitted to representative producers for their comment and criticism; those who desire to comment should address their letters to J. Lyman Briggs, acting chairman, Federal Specifications Board, Bureau of Standards, Washington, D. C.

The proposed specifications are given in full as follows:

Superseding F.S. SS-C-571, February 2, 1931, and F.S. SS-F-351, February 2, 1931

### *Proposed Federal Specification for Aggregate for Portland Cement Concrete*

This specification was approved for promulgation by the Federal Specifications Board on.....for the use of the departments and independent establishments of the Government in the purchase of this commodity, and shall become mandatory for all departments and independent establishments of the Government not later than.....
It may be put into effect, however, at any earlier date, after promulgation.

A. APPLICABLE FEDERAL SPECIFICATIONS.

A-1. Federal Specifications SS-C-181 and SS-C-191 shall form a part of this specification.

B. CLASSES, GRADES AND SIZES.

B-1. Classes.

B-1a. Class 1. Fine aggregate.

B-1b. Class 2. Coarse aggregate.

B-2. Grades.

B-2a. Grade A. Aggregate suitable for use in concrete structures in general. Grade A aggregates shall meet all of the requirements of this specification.

B-2b. Grade B. Aggregates suitable for use only in concrete protected from the weather. Grade B fine aggregate must meet all of the requirements of this specification for fine aggregate except soundness. Grade B coarse aggregates must meet all of the requirements of this specification for coarse aggregates except soundness and resistance to abrasion (E-2c) and weight per cubic foot (E-2d).

B-3. Sizes.

B-3a. Class 2 aggregates shall be furnished in one or more of the following designated sizes, as specified: (See E-2a [1]).

| | |
|---|---|
| No. 4 to ½ in. | No. 4 to 2 in. |
| No. 4 to ¾ in. | ¾ in. to 1½ in. |
| No. 4 to 1 in. | 1 in. to 2 in. |
| No. 4 to 1½ in. | |

C. MATERIALS.

C-1. Class 1 aggregates shall consist of natural sand, or, subject to approval, other inert materials having similar characteristics.

C-2. Class 2 aggregates shall consist of crushed stone, gravel, blast furnace slag, or, subject to approval, other inert materials having similar characteristics. The particular type or types to be furnished may be specified by the Department.

D. GENERAL REQUIREMENTS.

None.

E. DETAIL REQUIREMENTS.

E-1. Class 1. Fine aggregate.

E-1a. Grading.

E-1a (1). Fine aggregate shall conform to the following requirements: (See Note I-2).

Total passing—

| | Per cent. |
|---|---|
| No. 4 sieve | 95-100 |
| No. 16 sieve | 45-80 |
| No. 50 sieve | 10-20 |
| No. 100 sieve | 0-10 |

E-1a (2). For the purpose of controlling the grading of fine aggregate from any one source, the Contractor shall, prior to actual deliveries, submit a preliminary sample which shall be representative of the material which he proposes to furnish. Any shipment of fine aggregate made during the progress of the work which shows a variation in fineness modulus greater than 0.20 either way from the fineness modulus of the preliminary sample shall be rejected or, at the option of the Government, may be accepted subject to such changes in concrete proportions as may be necessary by reason of failure to comply with the requirements of this section.

E-1b. Deleterious substances.

E-1b (1). The substances designated shall not be present in excess of the following amounts:

| | |
|---|---|
| Material removed by decantation | 3% |
| Clay lumps | 1% |

E-1c. Mortar strength.

E-1c (1). Mortar specimens made with the fine aggregate shall have a compressive strength at 28 days of at least 90% of the strength of similar specimens made with Ottawa sand having a fineness modulus of 2.40 ± 10.

E-1d. Soundness.

E-1d (1). Grade A fine aggregate shall be considered to have met the requirement for soundness provided evidence satisfactory to the Government can be furnished that the aggregate has been exposed to natural weathering either directly or in concrete for a period of at least 5 years without appreciable disintegration.

E-1d (2). Grade A fine aggregate, failing to meet the requirements given in Section E-1d (1), shall be subjected to the sodium sulphate soundness test and shall meet the following requirement:

Loss by weight, not more than 10%.

E-2. Class 2. Coarse aggregate.

E-2a. Grading.

E-2a (1). Coarse aggregates of the sizes designated shall conform to the requirements as listed at the top of the page following. (See Note I-2.)

E-2b. Deleterious substances.

E-2b (1). The substances designated shall not be present in excess of the following amounts:

| | |
|---|---|
| Soft fragments | 5% |
| Clay lumps | ¼% |
| Removed by decantation | 1% |

NOTE: When the material removed by decantation consists essentially of crusher dust, the maximum amount permitted may be raised to 1½%.

E-2c. Soundness and resistance to abrasion.

E-2c (1). Grade A crushed stone and gravel shall be considered to have met the requirements for soundness and resistance to abrasion provided evidence satisfactory to the Government can be furnished showing that the material has proved satisfactory as coarse aggregate in concrete which has been subjected for a period of at least 5 years to essentially the same conditions of service and exposure as the structure in which the material is to be used.

E-2c (2). Grade A crushed stone failing to meet the requirement given in Section E-2c (1) shall be subjected to the standard Deval abrasion test and to the accelerated sodium sulphate soundness test, and shall meet the following requirements:

Percentage of wear, not more than.. 7%
Loss in sodium sulphate test, not more than .....15%

E-2c (3). Grade A gravel failing to meet the requirement given in Section E-2c (1) shall be subjected to the standard Deval abrasion test and to the accelerated sodium sulphate soundness test, and shall meet the following requirements:

Percentage of wear, not more than..15%
Loss in sodium sulphate test, not more than .....15%

E-2d. Weight per cubic foot of slag.

E-2d (1). Grade A blast furnace slag of the designated size shall meet the following requirement:

Weight per cubic foot, not less than 70 lb.

F. METHODS OF SAMPLING, INSPECTION AND TESTS.

F-1. Sampling.

F-1a. Number of samples. One representative sample shall be taken for each 150 tons of aggregate delivered (See I-2).

F-1b. Size of samples. Samples of fine aggregate shall weigh at least 25 lb. Samples of coarse aggregate as prepared for use shall weigh at least 50 lb.

F-1c. Samples of stone to be tested to determine compliance with the requirement given in Section E-2c (1) shall weigh at least 30 lb. and shall be composed of fragments of ledge stone measuring at least 2 in. minimum diameter.

F-2. Tests.

F-2a. Grading. A.S.T.M. Standard Method C41-24.

F-2b. Fineness modulus. The fineness modulus of fine aggregate is determined by adding the total percentages by weight retained on the following United States Standard Sieves and dividing by 100:

Nos. 4, 8, 16, 30, 50, 100.

F-2c. Decantation test.

F-2c (1). Fine aggregate. A. S. T. M. Standard Method D136-28.

F-2c (2). Coarse aggregate. American Association of State Highway Officials' Tentative Standard Method T-11.

F-2d. Clay lumps. The percentage of clay lumps shall be determined by examining the various fractions which remain after the test for grading (See F-2a). Any particles

GRADATION REQUIREMENTS OF COARSE AGGREGATE

| Designated sizes | Percentage by weight passing laboratory sieves having square openings | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2½-in. | 2-in. | 1½-in. | 1-in. | ¾-in. | ½-in. | ⅜-in. | No. 4 |
| No. 4 to ½ in. | ..... | ..... | ..... | ..... | 100 | 90–100 | ..... | 0–15* |
| No. 4 to ¾ in. | ..... | ..... | ..... | 100 | 90–100 | ..... | 20–55 | 0–10 |
| No. 4 to 1 in. | ..... | ..... | 100 | 90–100 | ..... | 25–60 | ..... | 0–10 |
| No. 4 to 1½ in. | ..... | 100 | 95–100 | ..... | 35–70 | ..... | 10–30 | 0–5 |
| No. 4 to 2 in. | 100 | 95–100 | ..... | 35–70 | ..... | 10–30 | ..... | 0–5 |
| ¾ in. to 1½ in. | ..... | 100 | 90–100 | 20–55 | 0–15 | ..... | ..... | ..... |
| 1 in. to 2 in. | 100 | 90–100 | 35–70 | 0–15 | ..... | ..... | ..... | ..... |

*Not more than 5% shall pass a No. 8 sieve.

that can be broken up with the fingers shall be classified as clay lumps and the total percentage by weight of all clay lumps shall be determined on the basis of the total original weight of the sample.

F-2e. Soft fragments. The American Association of State Highway Officials' Tentative Standard Method T-8.

F-2f (1). Mortar strength. A representative sample of fine aggregate weighing approximately 3,000 grams shall be immersed in water at room temperature for 30 minutes, removed, drained, spread out on a flat surface and allowed to air-dry until the surface moisture has evaporated and the sample is free-flowing.

F-2f (2). Six hundred grams of cement meeting the requirements of Federal Specification SS-C-191 and 360 ml. of water shall be placed in a watertight vessel and allowed to stand for one minute. The cement and water shall then be mixed into a smooth paste with a large spoon. Fine aggregate from a sample of known weight and prepared as specified in Section F-2f (1) shall then be gradually added and beaten into the mixture until the mortar, when tested in accordance with the method specified in Federal Specification SS-C-181 has a flow of $100 \pm 5$.

F-2f (3). Six 2-in. cubes shall be molded by placing the mortar in two layers, each layer being distributed over the entire area with the finger of the gloved hand, the mold filled to overflowing, and then struck off level with the top. The specimens shall then be placed in a moist closet as described in Federal Specification SS-C-181. At 20 to 24 hours after molding the specimens shall be removed from the molds and stored in water until tested.

F-2f (4). Comparative test cubes shall be made in the same manner, using Ottawa sand having a fineness modulus of $2.40 \pm 0.10$ (F-2b).

F-2f (5). The cubes shall be tested for compressive strength by loading in a direction parallel to the upper and lower surfaces when molded, three specimens being tested at 7 days and the rest at 28 days after molding.

F-2g. Soundness.

F-2g (1). Fine aggregate. A.S.T.M. Tentative Standard Method C88-31T.

F-2g (2). Coarse aggregate. A. S. T. M. Tentative Standard Method C89-31T.

F-2h. Resistance to abrasion.

F-2h (1). Stone. A.S.T.M. Standard Method D2-26.

F-2h (2). Gravel. A.S.T.M. Tentative Standard Method D289-28T.

F-2i. Weight per cubic foot of slag. A.S.T.M. Standard Method C29-27.

G. PACKING AND MARKING.

G-1. No requirements.

H. REQUIREMENTS APPLICABLE TO INDIVIDUAL DEPARTMENTS.

H-1. The following departmental specifications of the issue in effect on date of invitation for bids shall respectively form a part of this specification.

H-1a. Army: United States Army Specification No. 100-2, Standard Specification for Marking Shipments.

H-1b. Navy: Navy Department purchases will be made under the issue in effect on the date of invitation for bids of the Bureau of Yards and Docks Specification No. 13Y, Concrete Construction (copies of which may be obtained without cost upon application to the Bureau of Yards and Docks, Navy Department, Washington, D. C.).

H-1c. Marine Corps: Instructions issued by the Quartermaster's Department.

I. NOTES.

I-1. These specifications cover fine and coarse aggregates to be used in various types of concrete structures where strength and durability are the essential characteristics. Where strength and durability are both required, as in most structures exposed to the weather, grade A materials should be specified. Where strength only is required, as in most structures protected from the weather, grade B materials may be specified. Where special characteristics, such as weight, fire resistance, etc., are important, supplementary requirements covering such characteristics should be prepared.

I-2. The requirements for grading of fine and coarse aggregate specified in Sections E-1a (1) and E-2a (1) may be waived by the department in cases where it is found impracticable to obtain aggregates meeting the requirements specified herein. In such cases the department will substitute for the requirements herein given special requirements to meet the particular condition involved. The attention of the departments is called to the fact that when aggregates are employed which differ from the grading requirements herein given, it will in general be necessary to make adjustments in the proportions in order to insure that concrete of comparable quality is obtained.

I-3. It is not believed that it will be necessary, in general, to make a complete series of tests to determine compliance with the provisions of this specification on each sample taken during the progress of the work. Such samples will usually be tested in the field to determine compliance with the grading and uniformity requirements given in E-1a (1), E-1a (2) and E-2a (1). The Government reserves the right, however, to make any or all of the tests covered by this specification on any sample and to reject the material represented by such sample regardless of any approval of the source of supply which may have been given on the basis of previous tests.

## Canadian Feldspar Production in June

CANADIAN feldspar producers shipped 479 tons of feldspar during June, according to a report issued by the Dominion Bureau of Statistics. In May, 423 tons were shipped, and in June, 1931, shipments totaled 1643 tons.

## Mining and Processing Limestone for High-Grade Market

UNDERGROUND MINING of limestone and its further processing as carried on at the plant of Thompson, Weinman and Co., near Norristown, Penn., is described in the June issue of *Engineering and Mining Journal*. The products are used principally in the manufacture of rubber, paint and linoleum.

The deposit consists of three parallel veins of high-grade crystalline limestone lying at an angle of 58 deg. with the horizontal. A 10-ft. by 18-ft. main inclined shaft extends to a working level 160 ft. below the surface and the rock is hoisted in a 1-ton skip car.

It is planned to go to the 320-ft. level and a development shaft is being sunk below the 160-ft. level. However, at 235 ft. a fissure and a large flow of water were encountered, which stopped further development for the time being. Asphalt grouting methods of the American Asphalt Grouting Co., Chattanooga, Tenn., have been used in an attempt to stop the flow.

Normally about 2000 tons of limestone are mined per month, with a total crew of nine men for drilling and mucking. Ingersoll-Rand drills are used with 1-in. round Debitco drill steel and detachable bits made by the Flannery Manufacturing Co., Pittsburgh, Penn. One set of four bits was reported in use after 1300 ft. of drilling without resharpening.

Milling is done both dry and wet. In the dry system two products, one 98% minus 200-mesh and the other 99% minus 300-mesh, are made in 4-roll high-side Raymond mills. In the wet system Hardinge mills and hydraulic classifiers are used, the discharge from the classifiers being settled in Dorr thickeners and the settled product dried on Carterville steam drum dryers. The dried product is of a fineness of 100% minus 325-mesh.

The mill capacity is 2000 tons per month on a 24-hour per day basis for the wet system and a 10-hour basis for the dry system. Nine men comprise the mill crew.

## Asbestos Production in Canada, June, 1932

THE DOMINION Bureau of Statistics reports that the production of asbestos in Canada during June amounted to 7977 tons as compared with 9942 tons in May and 13,237 tons in June, 1931.

Quotations in June for the higher priced grades of asbestos continued at the May level. Single stocks ranged from $45 to $60 per ton as against $45 to $80 per ton in the preceding month. Prices for paper stocks, cement stock and floats showed a slight variation in June.

# Plotting Sieve Tests of Aggregates

## Part I—Methods Commonly Used

By Edmund Shaw
Contributing Editor, Rock Products

THE SIEVE TEST of an aggregate is not really complete until it has been graphed. The immediate purpose, as finding whether or not a material passes a certain specification, may require no more than the figures, but the *quality* of the grading cannot be judged easily without a graph. Even when one judges the quality from the figures alone he is apt to do so by making a mental plot of them.

A glance at a plot of a grading will show at once whether the grading is continuous or broken, whether coarse, fine or medium grains preponderate, and whether it is uniform or not. An expert can tell whether the sample was a mixture or a natural product and one familiar with the sands of a locality can tell by their plots what district a certain sand comes from. It is often easy, by plotting, to distinguish wind-classified dune sands from water-classified river sands, and the writer has known a testing sieve not belonging to the regular series used, although marked as belonging to it, to be detected from the graph.

Only by plotting is it possible to show how much of the sample will pass a sieve not in the series used, or how much is finer and coarser than a given diameter. Such figures as mean effective size and coefficient of uniformity can only be found by plotting.

Above all, the plot of the sieve analysis enables one to compare the grading of the sample with some standard or ideal grading and to see how much the product must be changed to bring it to what is wanted. In the same way we can compare the efficiency of crushers, grinders, screens and classifiers by comparing gradings of their feed and products with one another and with some ideal grading. The difference is not really appreciated in kind or extent until it is shown on a graph.

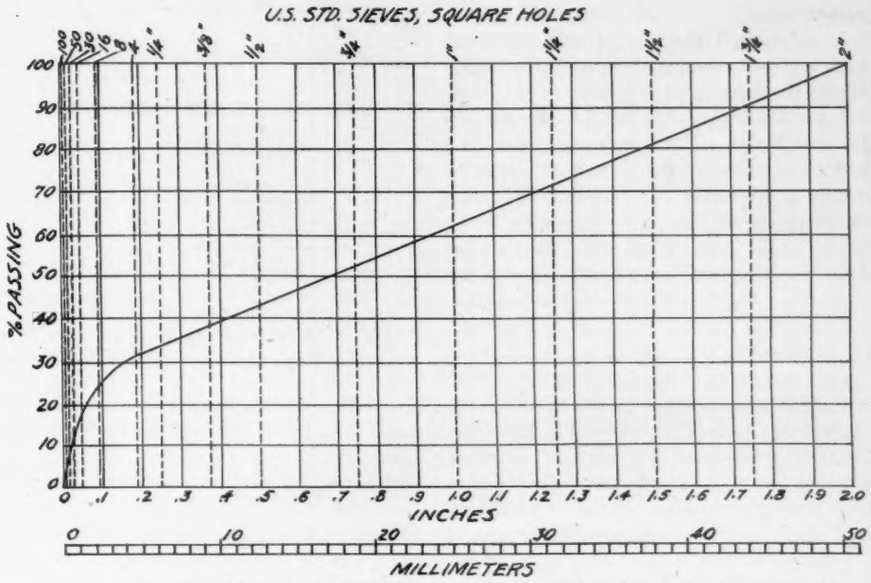



*Fig. 1. Chart used by Fuller to show grading of aggregates*

Since there are so many uses to be served by a plot it is natural that more than one method of plotting should have been devised.

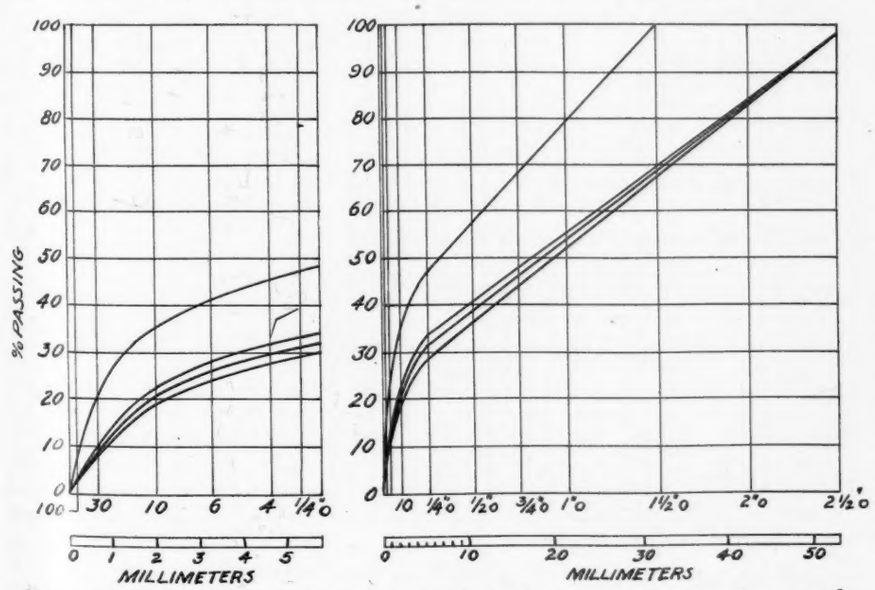



*Fig. 2. Gradation chart in which sand, at left, is plotted to a five times larger scale*

In fact there are so many methods that no article like this can mention them all. Methods found in standard textbooks have been included except one or two the writer has found useful where the sieve tests were to be understood by those not very familiar with such matters.

### *Plotting Older Than the Aggregate Industry*

The making of aggregates is so new an industry that it found testing sieves and methods of testing and plotting already well developed in the mining and chemical industries. It adopted these, fortunately, without making any changes. So now it is possible to have a single standard for testing sieves used in all industries, and it is also possible to draw on other industries for methods of plotting sieve tests.

In the aggregate industry the earliest work on grading of which the writer knows is that of Feret (1888). In his best known paper, on the effect of grading on strength, he used the triaxial plot for the grading. While this is useful, it is not adapted to showing a single grading well, since it represents an individual grading by a point and shows no more than that it is composed of certain percentages of fine, medium and coarse, and that it falls within a certain area. Its value is in comparing groups of gradings and it could be used to greater advantage than it is, as will be discussed further on.

Of American writers on concrete and ag-

gregates, Fuller was perhaps the first to feel the need of a method of plotting to show the differences in grading. The chart on which he plotted his gradings is shown in Fig. 1. This is redrawn from one of his papers (about 1905) and is substantially the same, except that the sieve numbers are those U. S. Standard sieves most commonly used today, although they were not known when Fuller's paper was written. The curve shown approximates one form of Fuller's curve.

In this graph the vertical and horizontal scale are both arithmetical; that is, the length of the divisions is proportional to the numbers on the scale. On the horizontal scale the full length of the scale represents the width of opening of the largest sieve used in testing, in this case 2-in., and all the other divisions are in the same proportion. The actual length is of course much greater than 2-in., for if it were not the divisions for the finer sieves could neither be read nor plotted. In fact, they cannot be easily plotted and read unless the graph is made very long.

And this great length is the principal disadvantage of this plot. It can be overcome in part by using two scales, the scale for the finer mesh sizes being several times as great as the scale for the coarser portion or the complete aggregate. Fig. 2 shows a plot with four curves where the sand portions are plotted to a five-times larger scale. Made in this way the direct plot is more readable but is still less readable than the logarithmic scale plots.

This direct form supposes the sieves to be placed one over the other as they are in making the sieve test. But there is another form of proportional plot in which the sieve openings appear to be placed one after another in a straight line.

This is shown in Fig. 3. The writer has never seen this form used with any but the standard Tyler sieves. The openings in these sieves have a ratio of 1.414 (the square root of 2) so that each horizontal division representing a sieve opening is made 1.414 times as long as the preceding division. This stretches out the plot even longer than the one just described, so that it can only be used for a few sieves. The example shown has only the sizes required to sieve sand from 4 mesh down and one can see that if it were carried to such coarse aggregate size as 2-in. it would be of a quite unmanageable length. The effect is to flatten the curve, as may be seen by comparing Fig. 3 with Fig. 1, the plots being of the same grading.

Nevertheless, the writer, when he was using it to plot several sieve tests daily, liked this graph. In the form shown there is room to plot the fine sizes comfortably and sieves not in the regular series can be interpolated as shown. Suppose that it is desired to put in a line to represent the No. 24 (Tyler) sieve which has an opening 0.70 mm. wide. A line is drawn from 83 on the vertical scale to cut the line for the 20 mesh sieve, because this sieve has an opening 0.83

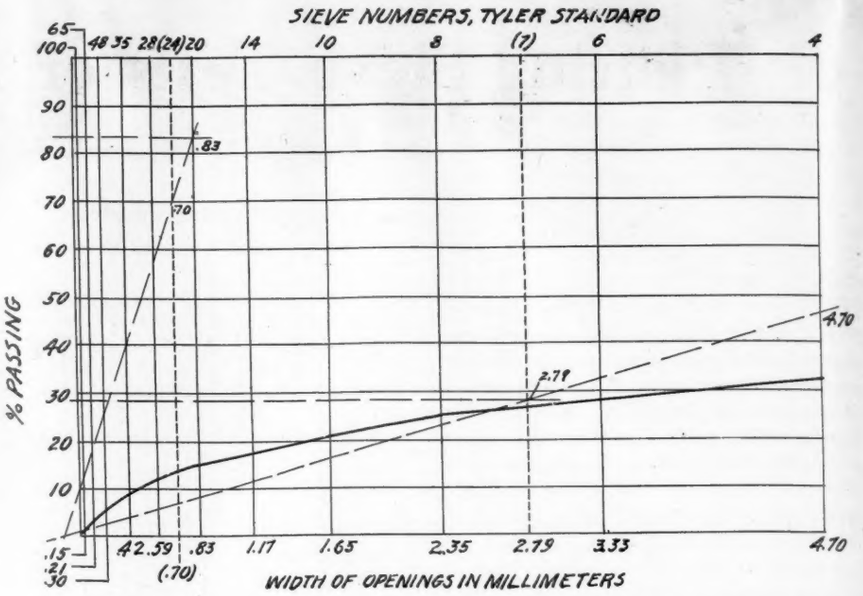



***Fig. 3. Chart where each successive sieve opening is located at a distance of 1.414 times the preceding division***

mm. wide. Then a diagonal is drawn from the zero point to the intersection so found. Where this diagonal is cut by a line from 70 on the vertical scale is where the No. 24 mesh line goes. It is just a matter of similar triangles. A line for the No. 7 sieve which has an opening of 2.79 mm. is shown interpolated in the same way.

### *Log-Scale Plots*

The disadvantages of these direct plots are more marked with aggregates than with other products because the range of sizes is wide, from 100 mesh, or even 200 mesh, to 2-in. or sometimes 3-in. In fact the aggregates for large dams and similar work may include sizes up to 10 or 11 in. diameter. And the plotting of the fine sizes, which is the hardest to read, is the most important. If one takes a lot of 1-in. material out of concrete aggregate and substitutes 1½-in. material the water-cement ratio is very little affected. But if one takes out the 8 to 16 mesh size of sand and substitutes an equal volume of 50 to 100 mesh grains the water-cement ratio will be considerably raised on account of the greater area to be wetted. The strength will be decreased and there are other reasons why the grading of the finer portion is more important.

So, for aggregates, the writer believes the better method of plotting is one that plots the fine sizes at least as clearly as the coarse sizes. There are two methods of doing this and the best known and most used is that based on the logarithmic scale. It is just

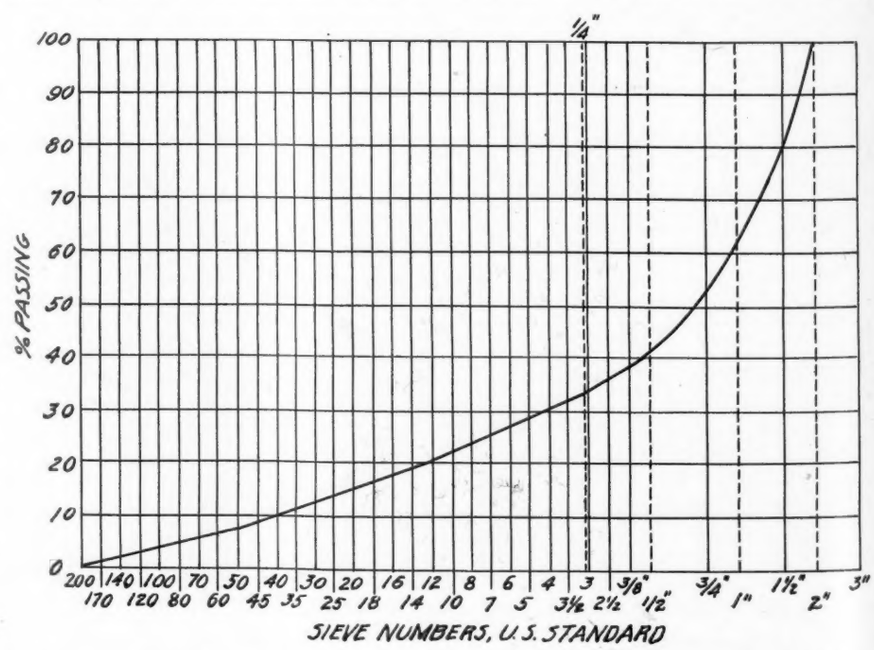



***Fig. 4. Logarithmic chart using all U. S. standard sieves from 200 mesh to 3 in.***

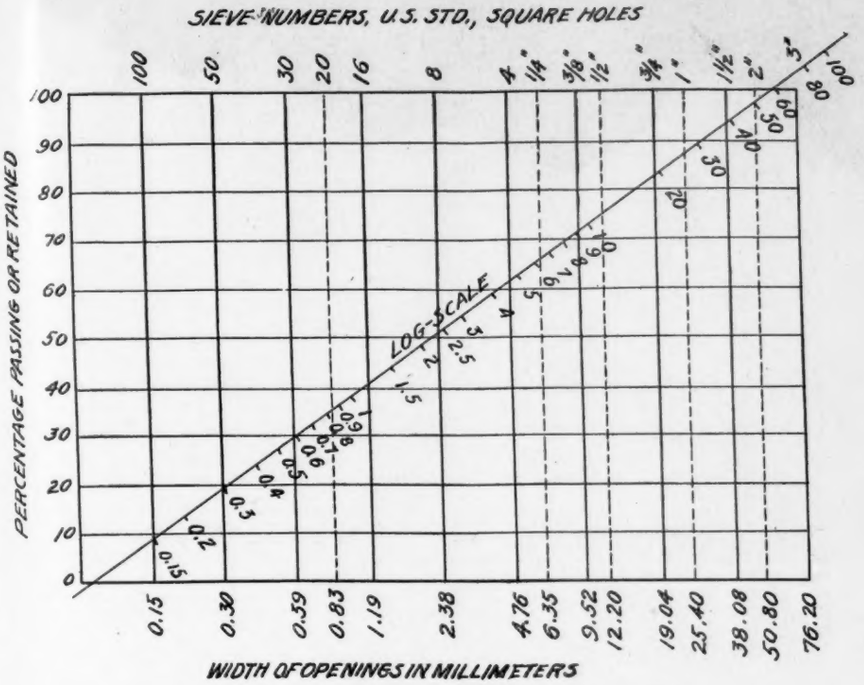



***Fig. 5. Method of interpolating sieve sizes by using a log scale***

the same as the other except that the logarithms of the widths of sieve openings are used.

*For any regular series of sieves, such as the Tyler or U. S. Standard, the openings of which have a constant ratio, the logarithmic spacing is equal spacing.* To tell why this is so would involve a study of the nature of logarithms, but it can be easily proven with a slide rule. On any scale measure the distances between the numbers 149, 177, 210, 250, 300, 350, 420, 500, etc., and it will be seen that they are equal. These are the widths of openings (in thousands of a millimeter) of the sieves in the U. S. Standard scale, Nos. 100, 80, 70, 60, 50, 45, 40, 35, etc. They have a constant ratio of the fourth root of 2, or 1.189, and hence the logs are at equal (arithmetical) spaces. If every other sieve is taken the distances are twice as great and the ratio is the square root of 2, or 1.414, and the spacing is also equal. If every fourth sieve is taken the ratio is 2 and the distances are four times as great. (This every fourth sieve is the series recommended for aggregates by the A. S. T. M. specifications.)

In every case, whatever set of sieves is taken, the log spaces are equal, so long as the ratio of one size opening to the next is constant. And so long as we make these spaces equal we may make them anything we please. If we use a series with a great many sieves we can set the lines so closely that we will just have room to write the figures comfortably, as in Fig. 4.

This shows the U. S. Standard series of sieves from 200 mesh to 3-in. It was drawn on a sheet of letter paper, the spacing between the verticals being 3/16-in. But the finest sizes can be plotted on it just as easily as the coarsest. An arithmetical scale plot for the same sieves would have been more than a yard long if the percentages on the finest sieves were to be easily read.

Convenience of plotting, however, has to be paid for by an entire change in the appearance of the curve. In Fig. 4 the plot is of the same grading as in Fig. 1, but the curves do not resemble one another. Where one is straight the other is curved, due to the retraction of the coarser spacing and where one is curved the other is straightened, due to the expanding of the fine size spacing.

Since the logs and not the actual widths of spaces are used, it is necessary to use a log scale to put in a sieve not in the series. The original plot of Fig. 5 is one designed for the plotting of aggregates and the heavy lines represent the sieves recommended by the A. S. T. M. standards for that purpose (Nos. 100, 50, 30, 16, 8 and 4-mesh and ⅜-in., ¾-in., 1½-in. and 3-in.). But there are other sieves such as ¼-in., ½-in., 1-in. and 2-in. not in this series which some customers want used because they are familiar with these sizes. These sieves have been interpolated. To do this accurately a logarithmic scale must be used and if the chart was not made from such a scale, but was made by drawing lines at equal distances horizontally the log scale corresponding must be found. It may be made from a piece of log-ruled paper on the runner of a slide rule and laid so that the numbers on the scale correspond with the widths as shown by the figures below. Then the lines are drawn in where the widths in millimeters come on the scale. This is perhaps easiest to see where the 20-mesh sieve line has been drawn in as a dotted line. The round hole sieves or the square hole equivalents may be drawn in in the same way.

When all the sieves that are used by one specification or another have been interpolated in this way, the graph becomes a conversion chart which may be used to change from one system of sieves to another. This was fully explained in an article by the writer in the May 9, 1931, issue of Rock Products. Such a chart is also called a multiple scale graph.

### *Reciprocal Scale Plots*

Another method has been devised to give the fine sizes even more space than they are given in the logarithmic plot just described. This makes use of the scale of reciprocals and a graph of this kind is shown in Fig. 6. The divisions on the horizontal scale are in proportion to the reciprocals of the widths of sieve openings. That is, the No. 8 sieve, for example, which has an opening of 2.38 mm., is drawn at $\frac{1}{2.38}$ or .42 on the lower scale. The curve is for the same grading as shown in Fig. 1. In Fig. 1 the lines for

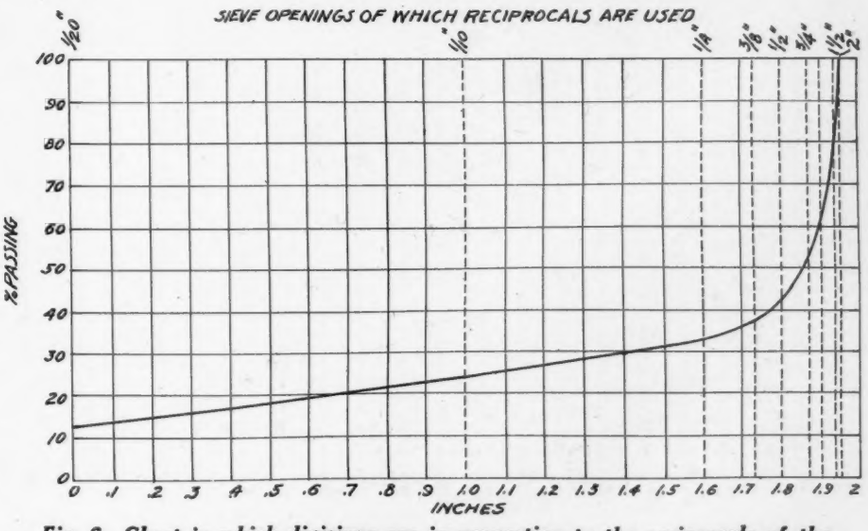



***Fig. 6. Chart in which divisions are in proportion to the reciprocals of the widths of sieve openings***

the fine meshes are crowded together as has been explained, but in Fig. 6 the reciprocal plot, the coarse sizes are crowded together just as badly.

The writer cannot recall having seen this plot used except in a few instances in connection with crushing diagrams. As a graph intended to give the characteristics of the grading it would seem to have little value. One bad feature is the enormous length it must have if many fine sizes are to be represented, for as the mesh size approaches zero the length of the graph approaches the reciprocal of zero, which is infinity. That is why the curve in Fig. 6 was not carried to a size finer than 1/20 of an inch (about 16 mesh). It would have doubled the length to have carried it to 30 mesh, maintaining the same spacing for the other sieve openings.

### *Double Log-Scale Plots*

Fig. 4 and Fig. 5 have only one log scale, the scale of percentages at the side being arithmetical. But double log scales are used and Fig. 7 shows one of a type in use by the engineering department of the city of Los Angeles. It has been adopted because it shows the finer sizes even more plainly than the ordinary single log scale graph. The writer recalls seeing such a graph in a specification for filter sands, drawn by the engineering department of Kansas City, Mo. It is not much used, but the writer has found it the best of all graphs for certain purposes.

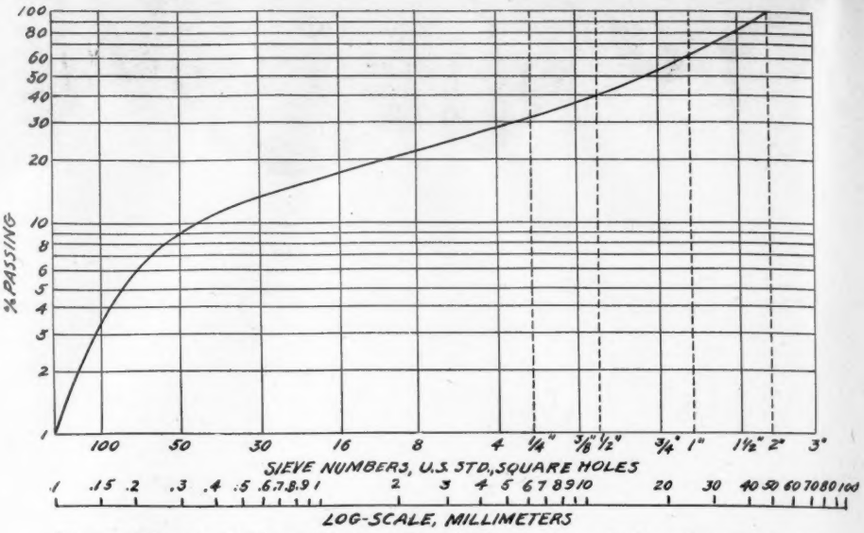



***Fig. 7. Chart using logarithmic scales for both sieve sizes and percentages passing each sieve***

One of its advantages is the plotting of sieve analyses that contain fractions of 1%. Sometimes it is extremely important to ascertain and plot such fractions accurately, as in fine grinding tests. The double log-scale plot offers the only practical way to do this. The scale of percentages may have a scale for tens, a scale for units and a scale for tenths, as shown in Fig. 8, and, if desirable, a scale for hundredths might be used. With the scale carried to tenths, as in Fig. 8, plotting can be carried to .01% with sufficient accuracy. A comparison of the curve and the sieve analysis will show this.

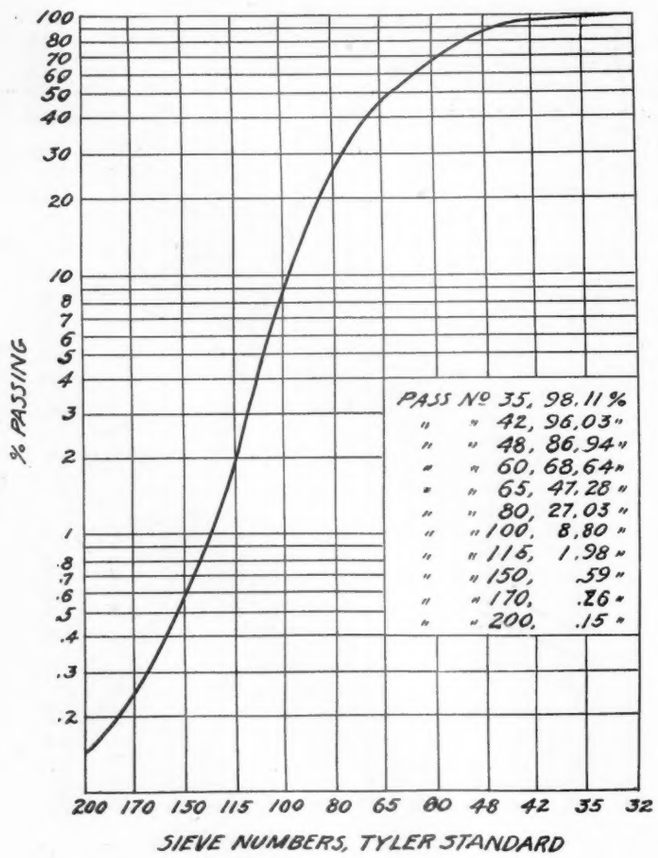



***Fig. 8. Double logarithmic chart having vertical scales for tens, units and tenths***

The curve in Fig. 7 is of the same grading as the curve in Fig. 1 and it is interesting to compare Fig. 1 (arithmetical scale), Fig. 4 (single log scale) and Fig. 7 (double log scale). Taking Fig. 1 as a standard we see that in Fig. 4 the curve is reversed, as well as being straight where the curve in No. 1 is curved. In Fig. 7 the curve is not reversed and the straight part of Fig. 1 is almost straight in Fig. 7.

There are so many valuable features about the double log plot that it should have a wider use. Its important field is where the fine sizes must be accurately plotted. The fact that the shape of the curve approaches that of the arithmetical plot is an added advantage.

### *Percentage Scale*

In all of the plots so far shown the distances on the horizontal scale have represented sieve openings or dimensions in inches or millimeters. But the horizontal scale in Fig. 9 represents percentages of a given size, which may be anything convenient for the gradings to be shown. The curves in Fig. 9 are the feed and the product of a small gyratory crusher and the product after it has been crushed in a disc crusher.

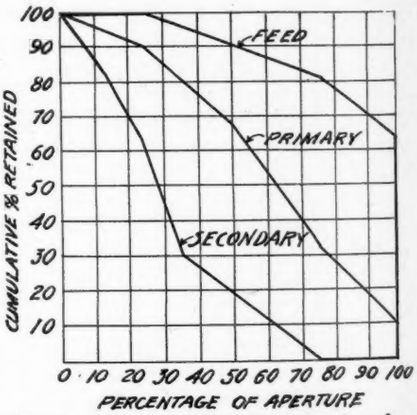



***Fig. 9. Chart in which horizontal scale represents percentages of a given size***

The writer has had no experience with this form of plot in testing crushers, but it appears to him to have many advantages for such work. It is to be noted that the plot is a square and that all curves begin at 100 on the horizontal scale and end at 100 on the vertical scale. It can be used to compare the products of similar machines even though the sieve analyses are not made with the same sieves, so long as the widths of openings are known. It may be used to compare the work of two very different crushers and it would show the difference in their work better than a plot of the ordinary kind.

*(To be continued)*

# Grinding Plant Research*

## Part VIII — Tests on Standard Sand in Experimental Mill with Smooth Lining Plates

By William Gilbert
Wh.Sc., M. Inst. C. E., London, England

### *Second Series of 18-in. Mill Tests (With Smooth Lining Plates)*

A set of smooth lining plates was next fitted to the mill. The average diameter inside the lining was 17.81 in. The grinding bodies used were:

| | Diameter, inches | Weight, ounces |
|---|---|---|
| Steel balls | 1¾ | 12.6 |
| Steel balls | 1.0 | 2.35 |
| Cylpebs (1.27 in. long) | 0.70 | 2.15 |
| Large flint stones | 2⅞ | 7.68 |
| Medium flint stones | 1¾ | 4.36 |
| Small flint stones | 1 5/16 | 1.62 |

The ratio of the sand volume to the volume of the voids between the grinding bodies was not varied since the previous tests had shown that an M.V. ratio of about 75% was satisfactory. Each class of grinding body was tested through a suitable range of speeds by grinding standard sand to a residue of 5% on 180 mesh as before.

The results with steel balls and cylpebs are given in Table X. The method of obtaining the charge volume per cent. and the volume of the voids has already been explained. Standard sand, as used dry, weighed 93.8 lb. per cu. ft. The method of calculating the quantity ground per hour and the horsepower per ton ground per hour was the same as before.



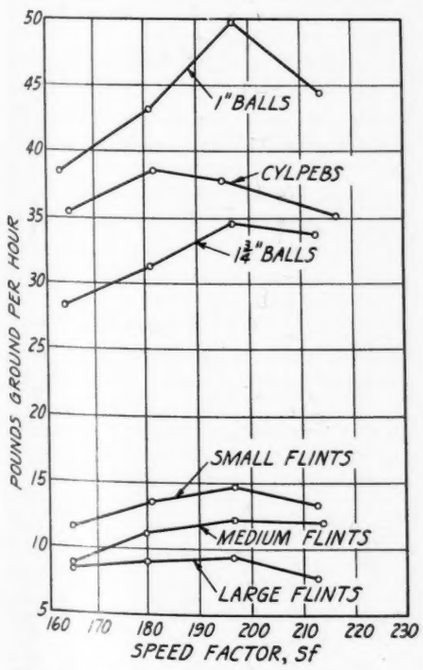



***Fig. 43. Relation between speed factor and output***

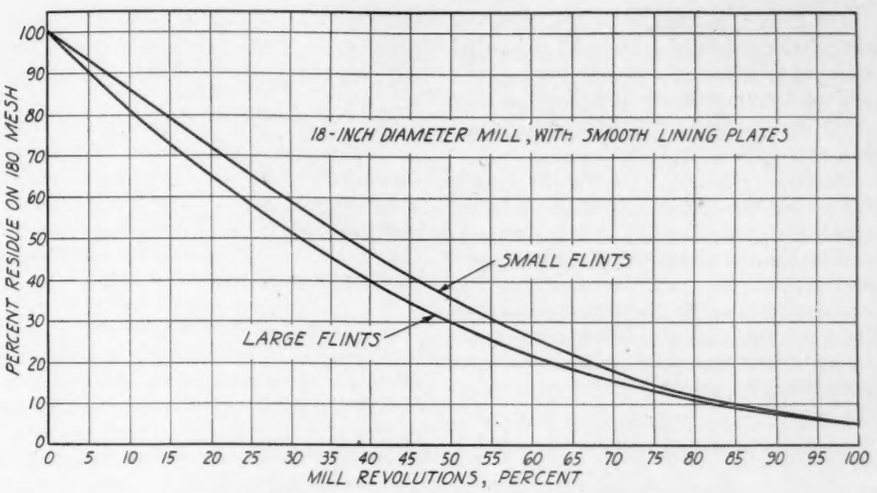



***Fig. 42. Relation between mill revolutions and fineness***

The experiments made with flint stones are summarized in Table XI. The specific gravity of flint, being considerably less than that of steel, the charge in the mill had to be reduced from 300 lb. to 110 lb.

The horsepower expended in mill friction is now a larger percentage of the total, hence the effect of deducting it is more marked. The test made at 40.2 r.p.m. is an example. After each thousand revolutions the mill was stopped and a sample taken for sieve tests.

In Fig. 42 the mill revolutions per cent. are plotted aganst the residues on the 180 mesh sieve, giving the lower curve. As previously explained when plotting the graphs the number of revolutions required to grind to a 5% residue is taken as 100.

The upper curve in Fig. 42 represents the experiment made on small flints at 40.1 r.p.m. The total mill revolutions were 7350 for the small flints against 10,000 for the large flints, which fact must be kept in mind when comparing the two curves in Fig. 42. Relatively speaking, the large flints ground better during the early stages, while the small flints were better throughout the whole of the range, but their advantage was somewhat more marked during the later stages of the grinding.

The figures given in Tables X and XI are shown in diagram form in Figs. 43 and 44. In Fig. 43 the speed factor is plotted against the quantity ground per hour. It will be seen that the best outputs were obtained when using 1 in. diam. steel balls, the cylpebs came second and the 1¾ in. diam. steel balls were third. The small flint stones are seen to give a larger output than the medium flints or the large flints. Reckoned per ton of charge the output, when using small flints, is approximately the same as when using cylpebs.

The speed factor is plotted against the horsepower per ton ground per hour (mill friction deducted) in Fig. 44. Here again the superiority of 1 in. diam. balls is mani-

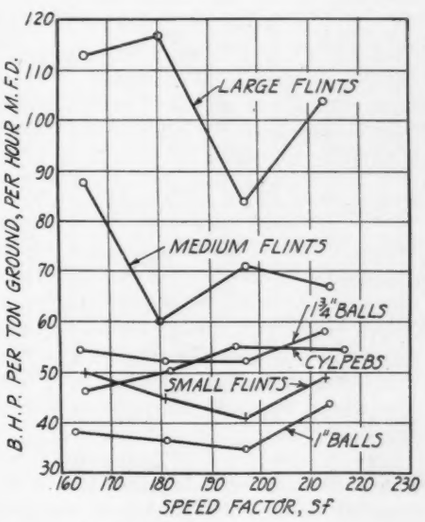



***Fig. 44. Relation between speed factor and horsepower***

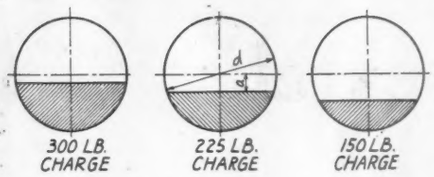



***Fig. 45. Diagram of charges***

fest. The small flints are seen to take less power than cylpebs, but when the mill friction is included, as it would be in practice, this is no longer the case.

The graphs on Figs. 43 and 44 bring out the relative values of 1 in. and 1¼ in. steel balls when grinding standard sand. In a mill of larger diameter, and hence greater depth of fall, the superiority of the smaller ball should be more marked.

*Analysis of Results.* On Fig. 35 a curve illustrating the grinding with 1 in. diam. steel balls (weighing 2.35 oz.) is given. It will be found almost identical with the curve derived from the small flints (weighing 1.62 oz.) as shown on the upper curve of Fig. 42, hence the two classes of grinding bodies operated with the same relative efficiency throughout the grinding range.

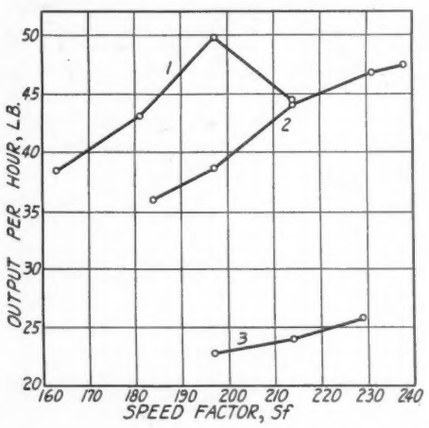



***Fig. 46. Relation between speed factor and output***

It will also be seen from Fig. 42 that the relative grinding efficiency of large and small flints varied throughout the range. The average advantage of the small flints over the large in horsepower per ton ground per hour is shown by the ratio:

$$\frac{\text{Large flints}}{\text{Small flints}} = 2.24$$

Taking, however, the range from 100 to 80% residue on the 180 mesh sieve, the ratio becomes 1.67, while for the range 20 to 5% residue on 180 mesh, the ratio is 2.53. Hence, the small flints are more efficient than the large flints throughout the range but their advantage is more marked, as would be expected, when fine grinding.

*Effect of Lifter Bars.* On comparing Figs. 40 and 41 with Figs. 43 and 44 it will be seen that smooth lining plates gave a better result than lining plates fitted with lifter bars, but a higher speed is required when using the former. In this instance the lining plates were of cast iron, and not machined, and they had not so far worn really smooth and bright.

Figs. 43 and 44 give a good general idea of the position, but further experiments would have to be made in order to obtain smooth curves, and to bring out the maximum and minimum points with real accuracy. One or two of the experiments would have been repeated had time permitted.

TABLE XII. 18-IN. MILL, WITH SMOOTH LINING PLATES AND PARTIAL CHARGES

| Description of grinding bodies | STEEL BALLS 1 in. diam. | | | | | STEEL BALLS 1 in. diam. | | | |
|---|---|---|---|---|---|---|---|---|---|
| Weight of charge used | 225 lb. | | | | | 150 lb. | | | |
| Charge volume, per cent | 30.0 | | | | | 20.0 | | | |
| Average weight of grinding body | 2.35 oz. | | | | | 2.35 oz. | | | |
| Weight of sand used | 26¼ lb. | | | | | 17½ lb. | | | |
| Ratio of sand to voids, per cent | 80.0 | | | | | 80.0 | | | |
| Mill average r.p.m. | 44.8 | 48.0 | 52.1 | 56.2 | 58.0 | 48.0 | 52.2 | 55.9 | 60.5 |
| Speed factor, sf | 184 | 197 | 214 | 231 | 238 | 197 | 214 | 229 | 248 |
| Revolutions to grind to 5% on 180 mesh | 1962 | 1962 | 1860 | 1890 | 1930 | 2210 | 2280 | 2270 | 3715 |
| Hp. supplied | 0.68 | 0.70 | 0.83 | 0.89 | 0.86 | 0.56 | 0.63 | 0.67 | 0.75 |
| Quantity ground per hour, lb. | 36.0 | 38.6 | 44.1 | 46.8 | 47.4 | 22.8 | 24.0 | 25.8 | 17.1 |
| Hp. per ton ground per hour | 42.3 | 40.7 | 42.0 | 42.6 | 40.5 | 55.0 | 59.0 | 58.1 | 98.4 |
| Hp. per ton, mill friction deducted | 33.2 | 31.6 | 32.8 | 32.6 | 31.6 | 41.1 | 44.6 | 43.3 | 72.5 |

### *Effect of Partial Charges*

In order to determine the proper charge of balls or cylpebs which should be used to replace flint stones, the following tests were undertaken. The results proved to be of considerable value, and they have been widely used in tube mill design.

The 300 lb. of 1 in. diam. steel balls previously used in the 18 in. mill gave a charge volume of approximately 40% of the mill volume, hence it was decided to try out charges of 30 and 20% respectively.

The charges used (including the original charge of 300 lb.) are shown to scale in Fig. 45 and are summarized in the table below.

| Weight of charge, lb. | Ratio $\frac{a}{d}$ per cent. | Charge volume, per cent. |
|---|---|---|
| 300 | 8.0 | 40.0 |
| 225 | 16.0 | 30.0 |
| 150 | 25.0 | 20.0 |

Using charges of 30 and 20% of steel balls, and similar charges of cylpebs, tests of output and horsepower were made at various speeds. The ratio of the sand volume to the volume of the voids was approximately 80% in all cases.

The experiments were made in the manner previously described, except that sieve tests were only taken over a short range between 6 and 3% residue on 180 mesh. The sieve residues were plotted against the corresponding mill revolutions, and the total number of mill revolutions required to grind to 5% residue on 180 mesh in each case was thus determined.

*Partial Charges of 1 in. diam. Balls.* The test results are set down in Table XII. The speed factor was varied through a considerable range. To enable the results given in Table XII to be more easily appreciated, the graphs, Figs. 46 and 47, have been prepared.

In Fig. 46 the quantity of sand ground per hour is plotted against the speed factor. For the sake of comparison the results obtained when grinding with a 40% charge of 1 in. steel balls have been taken from Table X, and plotted, thus giving curve No. 1. The 30% charge is represented by curve No. 2, and the 20% charge by curve No. 3.

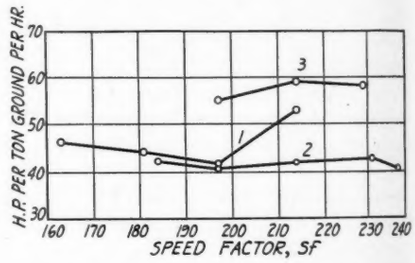



***Fig. 47. Relation between speed factor and horsepower***

The graph in Fig. 47 shows the horsepower per ton ground per hour plotted against the speed factor. The mill friction is not deducted, so that the figures from line 12 of Table XII are used.

Using a 40% charge, the curves marked 1 on each graph show that the maximum output and the minimum horsepower per ton ground per hour will be obtained when using a speed factor of approximately 197.

Using a 30% charge, the curves marked 2 show that the output steadily increases as the speed factor rises from 184 to 238, but

TABLE XIII. 18-IN. MILL, WITH SMOOTH LINING PLATES AND PARTIAL CHARGES

| Description of grinding bodies | CYLPEBS | | | | CYLPEBS | | | |
|---|---|---|---|---|---|---|---|---|
| Weight of charge used | 225 lb. | | | | 150 lb. | | | |
| Charge volume, per cent | 30.0 | | | | 20.0 | | | |
| Average weight of grinding body | 2.15 oz. | | | | 2.15 oz. | | | |
| Weight of sand used | 26¼ lb. | | | | 17½ lb. | | | |
| Ratio of sand to voids, per cent | 81.0 | | | | 81.0 | | | |
| Mill average r.p.m. | 39.9 | 44.0 | 48.0 | 52.0 | 40.1 | 44.1 | 48.0 | 52.0 |
| Speed factor, sf | 164 | 181 | 197 | 214 | 165 | 181 | 197 | 214 |
| Revolutions to grind to 5% on 180 mesh | 2210 | 2145 | 2015 | 2260 | 2285 | 2305 | 2230 | 2158 |
| Hp. supplied | 0.85 | 0.88 | 0.92 | 0.98 | 0.64 | 0.68 | 0.71 | 0.72 |
| Quantity ground per hour, lb. | 28.5 | 32.3 | 37.5 | 36.2 | 18.4 | 20.1 | 22.6 | 25.3 |
| Hp. per ton ground per hour | 67.0 | 61.0 | 54.7 | 60.5 | 77.8 | 75.4 | 71.0 | 63.2 |
| Hp. per ton, mill friction deducted | 55.8 | 51.2 | 46.0 | 50.8 | 60.7 | 59.7 | 56.6 | 49.5 |

the horsepower per ton ground per hour remains nearly constant, and relatively low, throughout the same range. Hence, this is a useful charge to use.

With a 20% charge, as shown by the curves marked 3, the output becomes relatively low, and the horsepower per ton ground per hour relatively high. Here again it is probable that a wide range of speed variation could be used, without much variation in the grinding efficiency.

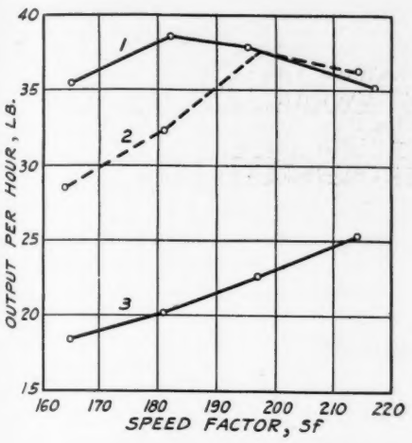



***Fig. 48. Relation between speed factor and output***

*Partial Charge of Cylpebs.* The results obtained when using cylpebs are summarized in Table XIII. The relations between the mill output per hour, the horsepower expended and the speed factor, are shown by the graphs, Figs. 48 and 49. The curves numbered 1, 2 and 3 on each graph relate to cylpeb charges of 300 lb., 225 lb .and 150 lb. respectively. The general result of the experiments will be clear from the graphs. It is seen that a 30% charge (or 225 lb.) is the best to use. The superiority of 1 in. diam. steel balls over cylpebs is apparent if Figs. 46 and 47 are compared with Figs. 48 and 49.

The tests above described were made at a period when rotary clinker at most of the English cement plants was being ground to a residue of about 10% on 180 mesh, a residue of 6 to 7% being reached at one or two plants only. The impression prevailed that the horsepower required to grind the clinker substantially finer would be excessive.

The tests which were made on the 18 in. mill, however, showed that standard sand could be readily ground to a residue of 3% on 180 mesh with 1 in. diam. steel balls, provided that the mill speed, the charge weight and the M.V. ratio were suitable. It was also apparent that the mill would grind considerably finer if required.

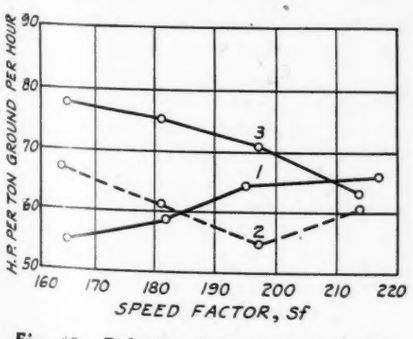



***Fig. 49. Relation between speed factor and horsepower***

Full particulars of the tests made on the 18 in. mill were circulated and two or three firms commenced to manufacture 1 in. diam. cast iron balls on a fairly large scale. A rapid improvement in clinker grinding followed, and it culminated in the production of rapid hardening cement. The grinding was carried to a residue of about 0.3% on 180 mesh. Particulars of a test on an 18 in. mill, in which standard sand was ground to a residue of 0.3% on 180 mesh, including a graph connecting the mill revolutions and the sieve residues throughout the range, will be given later.

*(To be continued)*

## Abrasive and Industrial Diamonds

TWO TYPES of diamonds are extensively used for industrial purposes: bort, or bortz, which are diamonds of the gem variety but unfit for cutting into gems, and carbonado, which are opaque and apparently amorphous. A general description of the various industrial uses of these diamonds, their application in these fields and the forms in which they are used is contained in Information Circular 6562, recently issued by the U. S. Bureau of Mines.

The history of this industry, mode of occurrence of these diamonds, mining methods, and preparation for market are discussed, as well as world production, domestic production and deposits, imports, tariff history, and market and prices. A list of dealers in industrial diamonds and of consumers is given.

## June Gypsum Production in Canada

THE CANADIAN production of gypsum during June amounted to 39,452 tons as compared with 66,139 tons in May and 125,325 tons in June, 1931, according to a report issued by the Dominion Bureau of Statistics.

Canada exported 30,195 tons of crude gypsum valued at $36,343 in June as against 11,110 tons worth $12,512 in the previous month.

## Canada's Mineral Products

PRODUCTION of nonmetallic minerals in June in Canada is reported by the Bureau of Statistics as follows:

PRODUCTION OF NONMETALLIC MINERALS IN CANADA

| | | June, 1932 | Six months ending June 1931 | 1932 |
|---|---|---|---|---|
| Asbestos | tons | 7,977 | 79,789 | 53,582 |
| Cement | bbl. | 566,992 | 4,538 444 | 2,307.647 |
| Feldspar | tons | 479 | 6,227 | 4,222 |
| Gypsum | tons | 39,452 | 293,131 | 151.752 |
| Lime | tons | 27,290 | 172,126 | 160,473 |

## New Stone Crushing Plant in Poland

A MODERN STONE crushing plant under construction near Kielce, in central Poland, was described in a recent issue of *Engineering Progress.* The material is a hard white quartzite which is hand-quarried by a crew of 150 to 200 men. The rock is loaded by hand to boxes which are moved on cars to a central point and then transported to the crushing plant by a cableway 3300 ft. long.

The crushing plant is arranged for gravity operation without conveyors or elevators except for the reelevating of the fine material. The raw material is delivered by the cableway at a height of 98 ft. above ground, falling to three 18.5-in. by 33.5-in. cast steel jaw crushers at the top of the plant.

From these crushers the material falls to two 6-ft. by 25-ft. double jacketed preliminary revolving screens which remove oversize and waste. The oversize falls to two jaw crushers of the same size as the primary crushers. The recrushed material as well as that from the preliminary screens falls to two long revolving screens, from which the fines fall to two additional revolving screens. The sized material falls to bin below.

These screens are interesting in that they are of unusual length and supported on two sets of tires and rollers. The upper set is 8 and 6 ft. in diameter and 52½ ft. long, while the lower set is of the same diameter and 46 ft. long. They produce sizes up to 3 in. Additional fine material may be produced in two roll crushers or two small jaw crushers or granulators. The plant has a capacity of 2000 tons in 8 hours.

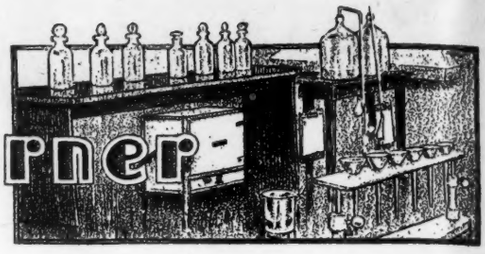
## Calculating Remaining Strength of Worn Wire Rope

CHARTS for calculating the remaining area of worn long lay wire rope are given in the July number of *Wire Engineering,* published by John A. Roebling's Sons Co., Trenton, N. J.

For greatest economy along with safety a wire rope should be replaced only when wear has reduced its area to the point of minimum strength or factor of safety previously decided on. This point has been usually guessed at by inspection, but such inspection in connection with certain measurements permits much greater accuracy.

The procedure is to measure with dividers the distance between the closest points of wear on the first and sixth wires of a strand in the worst rope lay, a lay being the length of rope in which one strand makes one complete revolution. This dimension is then used on a chart to obtain the percentage of area remaining from wear, and this percentage, along with the number of broken wires in the worst lay, is used on another chart to obtain the net area remaining. The charts were prepared from the results of tests made on worn samples of wire rope.

# The Chemists' Corner



# The Recast Analysis and Its Relation to the Chemistry of Portland Cement*

## Part V—Course of Crystallization (Continued)

By Louis A. Dahl

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IT has been previously shown that the percentage of melt can be determined graphically at any stage of the process of crystallization. In the burning of portland cement raw mixtures the percentage of melt is of considerable importance, and should be considered in the control of composition. The percentage of melt is of particular importance at comparatively low temperatures, since portland cement raw mixtures are burned at temperatures of incipient fusion. For that reason this study will begin at the point *T* in Fig. 11, Part IV.

When a mixture of $C_3S$, $C_3S$ and $C_3A$ is maintained at 1455 deg., the melting point at *T*, until a maximum amount of melt is formed, three solid phases will no longer be present. If the composition is in field *C, D, E, F, G* or *H* (Fig. 11), $C_3A$ will be absent, leaving $C_3S$ and $C_2S$ as the solid phases. If it is in field *A, B, I, J* or *K*, $C_2S$ will be absent, leaving $C_3S$ and $C_3A$ as the solid phases.

Let us consider first those compositions in which $C_3A$ is absent when a maximum amount of melt of composition *T* is formed, with $C_3S$ and $C_2S$ present. Under these conditions three phases are present, $C_3S$, $C_2S$ and the melt. Any mixture in the range of compositions under consideration may be considered as a mixture of these three phases, and may be treated as a separate and distinct ternary system in which $C_3S$, $C_2S$ and *T* are the components. In Fig. 12 this ternary system is represented by the triangle $C_3S$-$C_2S$-T.

The percentage of melt may be determined in the same manner as the percentage of a component is determined in any other three-component system. The triangle is divided into 10 equally spaced divisions by lines parallel to the $C_3S$-$C_2S$ side, which is the zero melt line. The percentage of melt increases in proportion to the distance from the $C_3S$-$C_2S$ line. Comparing the triangle $C_3S$-$C_2S$-T in Fig. 12 with the $C_3S$-$C_2S$-$C_3A$ triangle which is shown in the same figure, it is evident that the percentage of melt is proportional to the per cent. of potential $C_3A$.

It should be observed that the absence of a solid phase has made it possible to construct a triangle in which the zero melt line is the line joining the points representing the phases which are present. The two triangles $C_3S$-$C_2S$-T and $C_3S$-$C_2S$-$C_3A$ have a common base representing zero *T* in one case and zero $C_3A$ in the other. Percentages of the melt *T* and of potential $C_3A$ are each proportional to the distance from the common base, and are therefore proportional to each other. This illustrates a general principle that *when one solid phase is absent the percentage of melt is proportional to the potential percentage of the absent phase.*

Having established a general principle governing the percentage of melt when one solid phase is absent, it is possible to consider the percentage of melt in all compositions in the $C_3S$-$C_2S$-$C_3A$ triangle when a maximum proportion of the melt *T* is formed. This is shown in Fig. 13. In the triangle $C_2S$-$C_2S$-P, which is included in the triangle $C_3S$-$C_2S$-T, the percentage of melt is proportional to the percentage of potential $C_3A$, as has been shown. In the triangle $C_3S$-$C_3A$-P, the absent phase is $C_2S$, and the percentage of melt is consequently proportional to the percentage of potential $C_2S$.

As the temperature is raised above the melting point at *T* (1455 deg.), the composition of the melt may move along the line *TR* or the line *TS* (Fig. 11). Let us consider the case in which the melt follows the line *TS*. The line *TS* is the boundary between the $C_3S$ and $C_3A$ primary phase regions, indicating that these are the solid phases present, and that $C_2S$ is absent.

According to the general principle that when one solid phase is absent the percentage of melt is proportional to the potential percentage of the absent phase, it is known that as the melt moves from *T* to *S* the percentage of melt is proportional to the percentage of potential $C_2S$. If a triangle $C_3S$-$C_3A$-S is constructed similar to the $C_3S$-$C_3A$-T triangle in Fig. 13, the lines representing 10% intervals in percentage of melt will be more closely spaced, indicating that the factor by which to multiply the potential $C_2S$ to obtain the percentage of melt increases as the melt moves from *T* to *S*. By methods to be described later it is found that the factor for the melt *T* is 1.59; for the melt *S* it is 2.11.

Fig. 13 makes it possible to visualize the influence of varying proportions of limestone and clay upon the behavior of such mixtures in the process of burning. The broken line, labeled "mixture line," represents mixtures of lime (CaO) with an argillaceous material consisting of three

### Editors' Note

***IN previous articles the author has given methods of developing formulas to replace some of the old ratios used in expressing the relation between components of the raw materials used in the manufacture of portand cement. Geometrical methods used to explain the progress of the melt and the course of crystallization are continued in the present article.***

***—The Editors.***

parts of $SiO_2$ to one part of $Al_2O_3$. The position of a point on this line is governed by the proportions of lime and argillaceous material. The point $A$ represents the lowest percentage of lime in this series of mixtures which can be found in the $C_3S$-$C_2S$-$C_3A$ triangle. The point $C$ represents a high lime mixture, in fact the highest percentage of lime possible in the series of mixtures which can be made without obtaining a composition outside of the $C_3S$-$C_2S$-$C_3A$ triangle.

As the percentage of lime is increased from $A$ to $B$, the percentage of melt of composition $T$ which can be formed decreases. In this portion of the triangle the percentage of melt is governed by the potential percentage of $C_3A$. The mixture line is nearly parallel to the lines representing 10% intervals in percentage, and it is evident that the rate of change in percentage of melt as the lime is increased is not great. As the percentage of lime is increased from $B$ to $C$, however, the per cent. of melt decreases at a rapid rate, until at $C$ there is no melt present. The $C_3S$-$C_3A$ line represents the upper limit of lime in the $C_3S$-$C_2S$-$C_3A$ triangle, or portland cement region of compositions. When the process of burning is carried only to the point of incipient fusion, as in the manufacture of portland cement, the difficulty of burning increases tremendously as the $C_3S$-$C_3A$ (or zero $C_2S$) line is approached. If it is the aim to keep the lime as high as possible in order to maintain a high potential $C_3S$, compositions will be in the region in which the per cent. of melt is governed by the per cent. of potential $C_2S$, and the logical basis for control of the relation of the percentage of lime to the other components is to maintain a constant percentage of potential $C_2S$, as low as is found to be practicable.

It has been shown that when one solid phase is absent, the percentage of melt is governed by the potential percentage of the absent phase. This principle forms the basis for a method of computing the percentage of melt when the composition of the melt is known. This will be illustrated in the case of the melt $T$ (Fig. 10). The composition of the melt $T$ has been found by Rankin and Wright to be 58.3% CaO, 33.0% $Al_2O_3$, 8.7% $SiO_2$. Applying the equations for calculating potential composition to this composition, it is found to be equivalent to

| | |
|---|---|
| $C_3S$ | −50.5% |
| $C_2S$ | 63.0% |
| $C_3A$ | 87.5% |

In order to draw general conclusions, it is necessary to express the composition of a mixture in literal form.

Let $A$ = per cent. of potential $C_3S$ in mixture.
$B$ = per cent. of potential $C_2S$ in mixture.
$C$ = per cent. of potential $C_3A$ in mixture.
$A_s$ = per cent. of $C_3S$ in solid portion.
$B_s$ = per cent. of $C_2S$ in solid portion.
$C_s$ = per cent. of $C_3A$ in solid portion.
$r$ = fractional proportion of melt.
$1-r$ = fractional proportion of solids.

Any composition consists of $r$ parts by weight of melt $T$ and $(1-r)$ parts by weight of solids. The potential percentage of any component in the mixture is found by adding the results obtained when the potential percentage of that component in the melt is multiplied by the fractional proportion of melt, and the percentage of that component in the solid portion is multiplied by the fractional proportion of solids.

Therefore:

$$\begin{aligned} -50.5r + (1-r)A_s &= A \\ 63.0r + (1-r)B_s &= B \\ 87.5r + (1-r)C_s &= C \end{aligned}$$

Transposing:

$$\begin{aligned} (1-r)A_s &= A + 50.5r \\ (1-r)B_s &= B - 63.0r \\ (1-r)C_s &= C - 87.5r \end{aligned} \qquad (13)$$

$A_s$ is the per cent. of $C_3S$ in the solid portion. Since the solid portion is $(1-r)$ times the weight of the entire mixture, the per cent. of $C_3S$ in the mixture is $(1-r)A_s$. The same reasoning may be applied in regard to $C_2S$ and $C_3A$, and series 13 consequently represents the percentages of solid phases present in the mixture. They may be expressed as follows:

$$\begin{aligned} \text{Crystallized } C_3S &= A + 50.5r \\ \text{Crystallized } C_2S &= B - 63.0r \\ \text{Crystallized } C_3A &= C - 87.5r \end{aligned} \qquad (14)$$

The maximum percentage of the melt $T$ is present when one of the solid phases disappears. When this occurs, one of the above expressions becomes equal to zero. Obviously $C_3S$ cannot disappear, since both terms are positive. As $r$, which is the fractional proportion of melt, increases, one of the remaining expressions becomes equal to zero, signifying that that solid phase has disappeared.

When $C_2S$ disappears, $B - 63.0r = 0$
When $C_3A$ disappears, $C - 87.5r = 0$

Since the melt is increasing from zero to a maximum, the latter occurring when one phase disappears, the value of $r$ when this occurs is found by substituting the known values of $B$ and $C$ (the potential percentages of $C_2S$ and $C_3A$ in the mixture) in the two expressions, taking the least of the values of $r$ so obtained as the value of $r$ when the proportion of melt has reached a maximum. After the value of $r$ has been determined in this manner, the percentages of the solid phases may be calculated from the equations in Series 13 or 14. Let us illustrate with the composition 65% $C_3S$, 20% $C_2S$, 15% $C_3A$. In this case $B = 20$, and $C = 15$. Substituting in the above equations,

$20 - 63.0r = 0$ Or, $r = 0.317$
$15 - 87.5r = 0$ Or, $r = 0.171$

The least of these values is 0.171, which indicates that as the fractional proportion of melt increases from zero to 0.171 the solid phase $C_3A$ disappears, and the proportion of melt has reached a maximum. Applying this value of $r$ in the equations for the solid phases (Series 14), we obtain

| | | |
|---|---|---|
| Crystallized $C_3S$ | $= 65 + 50.5 \times 0.171 =$ | 73.6% |
| Crystallized $C_2S$ | $= 20 - 63.0 \times 0.171 =$ | 9.2% |
| Crystallized $C_3A$ | $= 15 - 87.5 \times 0.171 =$ | 0.0% |
| Melt | $= 100.0 \times 0.171 =$ | 17.1% |
| | Total = | 100.0% |

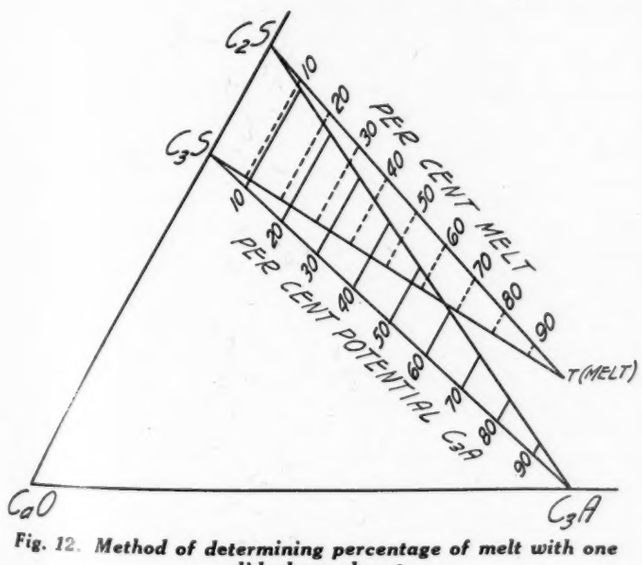



*Fig. 12. Method of determining percentage of melt with one solid phase absent*

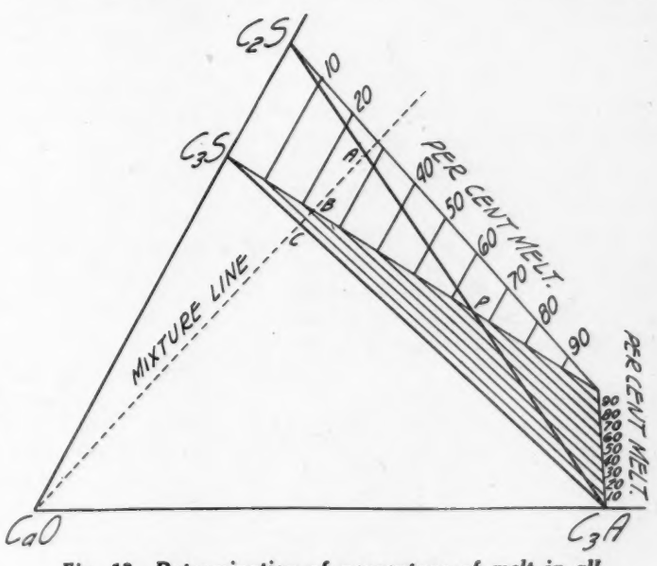



*Fig. 13. Determination of percentage of melt in all compositions*

In the previous graphic study of the problem it was shown (Fig. 13) that when the melt has reached a maximum, the percentage of melt in the triangle $C_3S$-$C_2S$-P is governed by the percentage of potential $C_3A$, and that in the triangles $C_3S$-$C_3A$-P the percentage of melt is governed by the percentage of potential $C_2S$. The mathematical method which has just been described leads to the same conclusions. In all compositions on the line $C_3S$-P the equation $B - 63.0r = 0$ and the equation $C - 87.5r = 0$ give the same value for $r$, indicating that both $C_2S$ and $C_3A$ disappear when the maximum percentage of melt is formed. For compositions in the triangle $C_3S$-$C_2S$-P, the equation $C - 87.5r = 0$ gives the least value of $r$, indicating that $C_3A$ is the solid phase which disappears. The per cent. of melt in this triangle is $100r$, or $100C/87.5$, or 1.14 times the potential $C_3A$. Similarly, in the triangle $C_3S$-$C_3A$-P, $C_2S$ is the disappearing solid phase, and the per cent. of melt is $100B/63.0$, or 1.59 times the percentage of potential $C_2S$.

The computations which have been described apply to all compositions in the $C_3S$-$C_2S$-$C_3A$ triangle when the melt has the composition $T$ (1455 deg.). As the temperature is raised, the melt may follow the boundary line $TR$ (Fig. 11), or the boundary line $TS$. Let us consider compositions in the fields $A$ and $K$, in which the melt follows the line $TS$. The line $TS$ is the boundary line between the $C_3S$ and $C_3A$ primary phase regions. The absent phase is $C_2S$, and the percentage of melt is governed by the potential $C_2S$. Any melt composition between $T$ and $S$ may be treated in the same manner as has been described for the composition $T$, to determine the per cent. of melt for each per cent. of potential $C_3S$. The per cent. of melt when the melt reaches the point $S$ may be determined from the potential composition of $S$, as has been done with $T$. According to Rankin and Wright, the point $S$ has the composition 59.7% CaO, 32.8% $Al_2O_3$, 7.5% $SiO_2$, which corresponds to the potential composition:

| | |
|---|---|
| $C_3S$ | —34.3 |
| $C_2S$ | 47.4 |
| $C_3A$ | 86.9 |

The equations for the percentages of the solid phases are:

$$\text{Crystallized } C_3S = A + 34.3r$$
$$\text{Crystallized } C_2S = B - 47.4r$$
$$\text{Crystallized } C_3A = C - 86.9r$$

In fields $A$ and $K$, $C_2S$ is the disappearing solid phase. The per cent. of melt when the point $S$ is reached is therefore $100B/47.4$, or 2.11 times the per cent. of potential $C_2S$. The increase of temperature from 1455 deg. at $T$ to 1470 deg. at $S$ has increased the factor from 1.59 to 2.11, or 33%.

It should be noted that as the melt approaches $S$ the solid phases are $C_3S$ and $C_3A$, with $C_2S$ as the absent phase. The melt leaves $S$ on the boundary line $SR$, with CaO and $C_2S$ in equilibrium with the melt. The equations for calculating potential composition which have been used up to this point can no longer be used for calculating the percentages of the solid phases, since they do not involve CaO as a product of crystallization. The mathematical method, however, may still be employed if the composition of the mixture or mixtures under consideration and the composition of the melt are expressed in terms of CaO, $C_3S$ and $C_3A$, instead of $C_3S$, $C_2S$ and $C_3A$. Graphically, this is equivalent to considering all compositions with reference to the triangle CaO-$C_3S$-$C_3A$, which is adjacent to the triangle $C_3S$-$C_2S$-$C_3A$.

By the methods which were used in deriving the equations in Series 2 for calculating potential composition in terms of $C_3S$, $C_2S$ and $C_3A$, the following series of equations are derived for calculating potential composition in terms of CaO, $C_3S$ and $C_3A$:

$$\begin{aligned} \text{CaO} &= \text{CaO} - 1.65\,Al_2O_3 - 2.801\,SiO_2 \\ C_3S &= 3.801\,SiO_2 \\ C_3A &= 2.65\,Al_2O_3 \end{aligned} \qquad (15)$$

In the first equation, the CaO term in the left-hand member refers to CaO considered as a final product of crystallization. In the right-hand member it refers to CaO as a component in the oxide composition. The per cent. of CaO present as a final product of crystallization is less than the per cent. present in the oxide composition by an amount which is dependent upon the percentages of $Al_2O_3$ and $SiO_2$, as indicated.

As the melt moves along the line $SR$ (Fig. 11) the solid phases in equilibrium with the melt are CaO and $C_3S$, with $C_3A$ as the absent phase. The per cent. of melt is consequently proportional to the potential percentage of $C_3A$, calculated by means of the $C_3A$ equation in Series 15. The proportions of melt and of solid phases may be calculated by the methods previously used, using the equations in Series 15 throughout, instead of the equations in Series 2. It may be observed, however, that the $C_3A$ equation in Series 15 is the same as the $C_3A$ equation in Series 2, so that if the per cent. of melt alone is of interest, and it is not intended to compute the percentages of the solid phases, it is unnecessary to use Series 15.

When compositions in the fields $A$ and $K$ are heated to temperatures between 1455 deg. and 1470 deg., the melting point of $S$, $C_3S$ and $C_3A$ are in equilibrium with the melt, and the per cent. of melt is proportional to the potential percentage of $C_2S$. When the temperature exceeds 1470 deg., CaO and $C_3S$ are in equilibrium with the melt, and the per cent. of melt is proportional to the potential percentage of $C_3A$. It should be particularly noted by the reader that when equilibrium is attained under the latter condition, uncombined lime, or "free lime," is present, which will not disappear until the mixture is cooled below 1470 deg.

A state of equilibrium is a state of balance between phases present in a system, resuting in a "stationary" condition as long as conditions such as pressure and temperature are not changed. In cement literature the term "equilibrium" is often used incorrectly. It is sometimes stated, for instance, that portland cement clinker will consist of certain compounds (the final products of crystallization) "at equilibrium," or "if equilibrium is attained." It is usually implied in such statements that there is a successive formation of compounds during the process of burning, and that at some high temperature all of the components are combined to form the calculated proportions of the compounds represented as the final products of crystallization. This concepton of the conditions existing under a state of equilibrium would perhaps be sound if the system under consideration were one in which the liquid phase is undissociated. In that case the primary phase region of each compound would be confined to a range of compositions in which the compound is one of the final products of crystallization. In the system CaO-$Al_2O_3$-$SiO_2$, however, there are a number of instances in which the primary phase region of a compound extends into a triangle in which the compound is not represented at one of the vertices. The CaO primary phase region, for instance, extends into the $C_3S$-$C_2S$-$C_3A$ triangle, and into the $C_2S$-$C_3A$-$C_3A_3$ triangle. The $C_3S$ primary phase region also extends into the $C_3S$-$C_3A$-$C_3A_3$ triangle.

In view of the possibility that the liquid phase may be highly dissociated, it is well to consider the liquid phase as a phase composed of certain percentages of CaO, $Al_2O_3$ and $SiO_2$, which may or may not be combined. A melt located in the $C_2S$-$C_3A$-$C_3A_3$ triangle certainly cannot be regarded as being composed of $C_3S$, $C_2S$ and $C_3A$, nor can a glass formed by the undercooling of such a melt be so regarded. It is on account of these considerations that throughout this paper the melt is treated as an extraneous substance which cannot be assumed to consist of portland cement compounds.

Since the decomposition of the original substances in a mixture of raw materials takes place through reaction with the melt, the presence of a sufficient proportion of melt is of great importance in the process of burning. In the control of composition in a process of burning in which only partial fusion is attained, as in the manufacture of portland cement, the influence of composition upon the percentage of melt should be taken into consideration. In any particular field of compositions in which one particular solid phase is the last to appear on cooling, or is first to disappear on heating, the potential amount of that phase governs the percentage of melt. This is illustrated by the triangle $C_3S$-$C_2S$-P in Fig. 13, in which the percentage of potential $C_3A$ governs the percentage of melt, and the triangle $C_3S$-$C_3A$-P, in which the percentage of potential $C_2S$ governs the percentage of melt. After selecting a particular field, and defining its limits, the "burnability" of the mixture may be controlled by maintaining a constant potential percentage of the com-

pound governing the percentage of melt in that field. In the case of high-lime mixtures such as those in fields *A* and *K* in Fig. 11, the percentage of potential $C_3S$ should be maintained constant.

Now let us suppose that a certain range of compositions in the field *A*, or in the field *K*, is chosen as a basis for operations, and that it is proposed to control the potential $C_2S$, in order to maintain uniform burnability. It becomes natural to inquire into the means by which the potential $C_2S$ may be controlled. The equation for $C_2S$ is given in Series 11:

$$C_2S = 8.601\ SiO_2 + 5.068\ Al_2O_3 - 3.071\ CaO$$

To aim at a constant value of $C_2S$ is equivalent to aiming at a constant value of the right-hand member of the equation, or,

(16)
$$8.601\ SiO_2 + 5.068\ Al_2O_3 - 3.071\ CaO = k$$

This equation represents the relation between the components to be maintained in high-lime mixtures in order to maintain uniform burnability. It may be substituted to advantage for empirical ratios used for controlling the lime balance.

If it is desired, the above equation may be divided throughout by 3.071, the coefficient of the CaO term, in order that it may be expressed in terms of CaO. The equation then becomes

(17) $2.801\ SiO_2 + 1.65\ Al_2O_3 - CaO = K$

This equation may be regarded as a modulus for controlling the relation between the percentage of CaO and the percentages of the other components, $SiO_2$ and $Al_2O_3$. Now let us consider its meaning. In the compound $C_2S$, the CaO is 2.801 times the per cent. of $SiO_2$. In the compound $C_3A$, the CaO is 1.65 times the $Al_2O_3$. The sum of the first two terms is consequently the percentage of CaO required for saturation with lime. The third term is the percentage of CaO actually present. The entire expression, which is the difference between the percentage of CaO required for saturation and the CaO actually present, is therefore the percentage of lime which must be added to saturate the mixture, and may be called the *lime deficiency*. The lower the value of *K*, the nearer is the approach to saturation. If *K* is equal to zero, the mixture is saturated.

Since *k* is 3.071 times *K*, it is evident that the potential percentage of $C_2S$ is proportional to the lime deficiency. It is possible to arrive at this conclusion in another manner. $C_2S$ is the only compound in the system which is not saturated with lime. The compound $C_3S$ involves the same oxide components, but contains one mole of CaO in excess of that contained in $C_2S$. If sufficient CaO is added to combine theoretically with the $C_2S$ to form $C_3S$, the mixture is saturated with lime. The lime deficiency, which is the amount of lime which must be added to saturate the mixture, is consequently proportional to the potential percentage of $C_2S$.

Equation 17 may now be compared with the equation which would be obtained by the standard procedure for deriving an equation for representing an ideal relation between the percentage of lime and the percentages of other components, which was mentioned in the early part of this paper. According to this procedure, the per cent of CaO is divided by the expression representing the per cent. of CaO required for saturation, or

$$(18)\quad \frac{CaO}{2.801\ SiO_2 + 1.65\ Al_2O_3} = K_1$$

This equation is equivalent to equation 17 for mixtures which are saturated with CaO, that is, when $K = 0$ and when $K_1 = 1$. The equations are not equivalent for ranges of compositions which are not saturated with CaO. Equation 17 is based entirely upon scientific considerations. Equation 18 is based upon scientific considerations plus the assumption that equations to represent relations between components must be in the form of ratios. It will be shown later, when the computation of raw mixtures is considered, that equations in the linear form, such as equation 17, lead to simple methods of computation.

*(To be continued)*

## Measuring Particle Sizes of Portland Cement

A PAPER by P. S. Roller delivered at the June meeting of the American Society for Testing Materials discusses the use of the air analyzer to measure the finer particles of cement. The device used is one that has been described in Rock Products and other technical papers. Its principal feature is a U-tube and air jet used as a feeder.

The study of the air analyzer is making it possible to standardize its use. One of the difficulties has been to set an end point for the time of separating a fraction, for it was found that the longer the blowing was continued the coarser were the particles that came over. This was explained by the law of flow, which is that the flow in the center of the tube has twice the average velocity. This means that the largest particles blown over are 1.414 times what they should be from Stokes' law. For the conditions, the end point with the analyzer used was found to vary with the fineness of the separation. For 0 to 5 microns, the finest separation, about one hour was required, and for the coarsest separation (40 to 80 microns) 11 minutes was required. The work was very close, the average deviation of the percentage results being only 0.25%, and in later results this was reduced to 0.17%.

The measurement of particles for checking the work of the analyzer was by a microscope, and the author describes a rapid method of dispersing the fine powder on a slide. This is to use a drop of a 0.25% solution of saponin in 50% alcohol, and a very thin platinum wire to spread the wetted particles on the slide. Drying is rapid and the slide can be examined as soon as dry.

The author ascribes the supposed overlap of fractions according to Stokes' law to wrong measurement of particles and to the use of the arithmetical mean instead of the harmonic mean. The experiments appear to show that the true surface mean diameter is the mean of the theoretical Stokes' law limit.

A statistical study of results of separation show that there is a primary maximum at 5.4 microns and a second hidden maximum at 22 microns. The article says of that: "This result is of interest for cement technology because it shows that there is a definite segregation during grinding of the constituents of portland cement into particle-size categories."

It is often said that grinding clinker in a laboratory mill cannot give the same results as grinding the same clinker in a mill of standard size. One of the tables in the article gives results of laboratory grinding on three different clinkers and shows that the particle size distribution is practically the same as when ground commercially.

## Japanese Standard Specification for Portland Cement

THE present Japanese standard specification for portland cement, revised in 1930, includes the following, according to a translation by the Association of Japanese Portland Cement Engineers:

The specific gravity shall be not less than 3.05. The fineness shall be such that not more than 12% remains on a sieve of 4900 meshes per sq. cm. (approximately equivalent to U. S. Standard 170-mesh sieve). The initial setting time shall be not less than 1 hour and the final setting time not more than 10 hours (determined by the Vicat needle).

The compressive strengths of 1:3 test cubes having a face area of 50 sq. cm. shall be more than 150 kg. per sq. cm. at 3 days; more than 220 kg. per sq. cm. at 7 days; and more than 300 kg. per sq. cm. at 28 days. Tensile strengths shall be more than 20 kg. per sq. cm. at 7 days and more than 25 kg. per sq. cm. at 28 days.

## Directory of Commodity Specifications

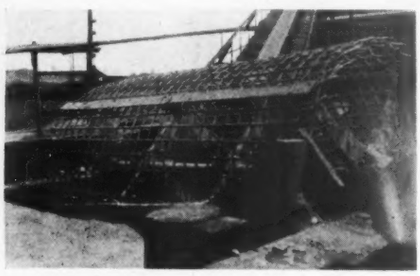
THE STANDARDS Yearbook for 1932 has been issued by the Bureau of Standards. The book is prepared as a concise summary for those with little time but who need to keep in touch with the latest advances in the standards field.

The second revised edition of the National Directory of Commodity Specifications has also been issued and in it are listed the title, designating number, and sponsoring organization, standards and methods of test for all commodities regularly produced in this country. Each specification is also briefly summarized as to technical characteristics, scope and special applications.

# Hints and Helps for Superintendents

## Inexpensive Scalping Screen

IOWA sand and gravel deposits invariably contain a high percentage of sand with the gravel of relatively small size. However, through the deposits large boulders can



***Scalping screen makes 1 r.p.m.***

invariably be found, many of which are "man size" or larger. Owing to the shortage of gravel the producers as a rule crush this oversize material. Either Universal or Iowa Manufacturing Co. crushers are used in practically all Iowa plants for this purpose.

To handle this oversize material the Clear Lake Sand and Gravel Co. installed an inexpensive scalping screen which has proved quite efficient, removing the oversize from 30 to 40 cars of material per 10-hour day and requiring only 2-hp. to operate. They chose a wire cloth as the screening media. The wires are ⅝-in. round, high carbon steel and were manufactured by the Twin City Iron and Wire Co. This type of screen is of light weight, yet has a large screening capacity and due to the special crimp used, a long life is obtained.

The rotary screen is about 8 ft. long and 4 ft. in diameter and has three supporting hubs, mounted on a central shaft, the design providing light weight, yet strength to stand the gaff. The novelty of the layout is that the screen revolves about once per minute, being driven from a 2-hp. General Electric motor through a system of belt and chain reductions. No water is added at the scalper but the material is damp, having been taken from the pond by a special drag scraper and delivered to a long field conveyor that in turn delivers to the scalper screen.

The oversize from this scalper falls to a 10- by 20-in. jaw crusher and is returned to the main feed belt by a short inclined belt conveyor.

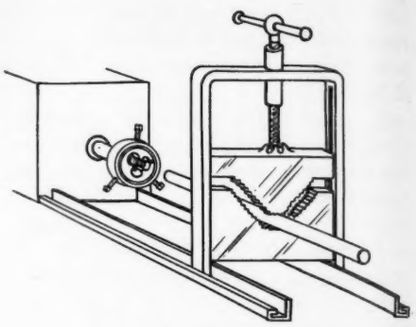
The construction details of this installation can be obtained from accompanying illustrations.

## A Handy, Inexpensive Bolt Threader

**By Dare Paris**
Monrovia, Calif.

AROUND the plant where there are lots of bolts used a great number of them find their way to the junk pile because of worn or bruised threads. Here is a threading outfit which was rigged up from pieces about the plant for the reclaiming of old bolts. It has proved a worth-while piece of equipment.

The bench is built of angle iron which forms a track and carriage for the vise to ride on. The frame of the vise is made up of ½-in. by 2-in. iron cut and welded together. The lower jaw is adjustable for the threading of different sized bolts. A piece of ¼-in. plate iron is welded to the bottom of the vise for a base to slide in the tracks



***Reclaims damaged bolts***

and as the bolt is fed into the die the vise slides along on the track.

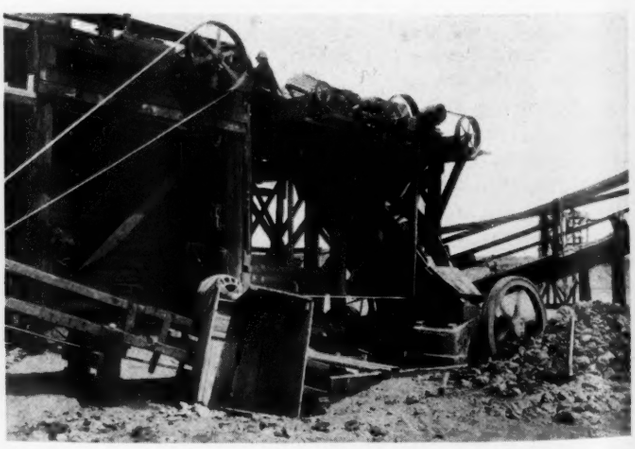
The holder for the die is made from a piece of heavy pipe welded on the transmission shaft. Set screws are used for holding the die in place. A transmission may be taken from a discarded car or it may be run off of line shaft. A loose pulley is used instead of a clutch when running this from a line shaft.

## Uses Wire Rope Instead of Rail Guides

ONE MAN does the work of five in hoisting rock from the quarry floor to ground level since a new skip hoist was installed by the Big Bend Quarry Co., St. Louis, Mo., the *Yellow Strand* reports.

This novel skip hoist was devised by R. N. Skrainka, secretary-treasurer of the company, and Thomas F. Bush, superintendent.

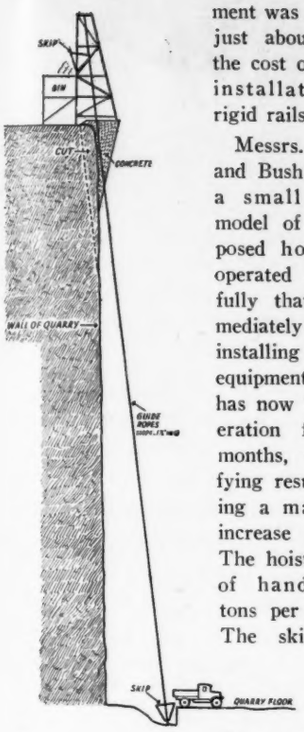
In designing the hoist the inventors conceived the idea of using wire ropes instead of the usual steel guard rails with their supporting framework. As a result, the equip-



***Material passing screen is carried away on conveyor at right; that retained is crushed and returned***

ment was installed at just about 25% of the cost of a similar installation using rigid rails.

Messrs. Skrainka and Bush first made a small working model of their proposed hoist, which operated so successfully that they immediately set about installing the actual equipment. The hoist has now been in operation for several months, with gratifying results, including a material increase in tonnage. The hoist is capable of handling 2000 tons per 10-hr. day. The skips are of 5-ton capacity each. The quarry is 200 ft. in depth.



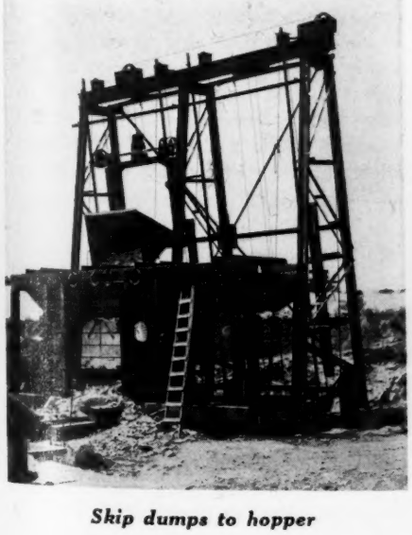

***Wire ropes guide skip***

The accompanying illustrations show the general arrangement of the hoist and the method of operation. In the quarry are two 5-ton trucks, which are loaded by means of a gas shovel. The trucks dump the rock directly into the skips. A double drum hoisting engine is used, with separate hoisting ropes for each skip.

The hoist is of a reciprocating type. The skips are connected by a steel cable and counterbalance each other when empty. There are two 1-in. guide ropes for each of the skips. These ropes are anchored by bolts to the quarry floor on a slope of 1½ in. to the foot. A surplus length of cable is carried on the bottom so that when the quarry floor is lowered it will be necessary only to let the cables out and re-anchor them.

Where new rope was used for this installation, Broderick and Bascom plow steel was specified.

Patents are pending on the new device.



***Skip dumps to hopper***

## Safety Rules for Truck Drivers

THE following rules for highway materials truck drivers are from a contemporary English publication, which credits them to "an important highway department":

(1) Be courteous at all times.

(2) Be neat about your personal appearance.

(3) Regulate the speed of your truck according to road and weather conditions.

(4) Slow down at road intersections.

(5) Do not pass vehicle ahead on curves.

(6) Do not pass vehicle ahead on grades or hills.

(7) Do not follow vehicle ahead too closely. State law prohibits trucks from traveling closer than 100 ft. except when passing.

(8) Stay in line when traffic is heavy.

(9) Stay on right side of road when on way to and from work.

(10) Do not stop on roadway.

(11) Do not move against traffic unless nature of work makes it unavoidable.

(12) Place torch or flare 100 ft. in rear of truck if stalled at night.

(13) Place red flag in upright position on shoulder of highway at least 200 ft. in rear of truck when stop is made in daylight on roadway.

(14) Inspect lights every two hours when on road at night. (Do not stop on highway to make inspection. Stop at next town.)

(15) Before backing be sure no person or vehicle is behind you. Back slowly. Have helper at rear if possible.

(16) Apply brakes slowly. Do not make sudden stops.

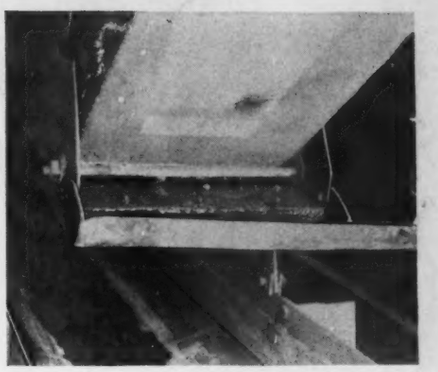
(17) When making left turn give oncoming traffic sufficient warning. Stop for safety.

(18) Use extreme caution when children are on the road.

## Stops Water from Dripping on Reclaiming Belt

WATER continually dripping on belts decreases their life so one sand company has devised a means of keeping water off its reclaiming belt to a large extent.

The belt is in a reclaiming tunnel and is fed by a number of chutes from the bins above. When the chute gates are closed and the chutes raised out of the way the water formerly leaked through the gates and down onto the belt. So the company formed a piece of sheet metal into a trough, welded an end piece to one end and a support near the middle and bolted this to the end of the chute where water dripped to the belt.



***Drains water when gate is closed***

Now the leaking water flows into the trough and is carried off to the side where it is emptied into a drain. The arrangement in no way interferes with the use of the chute when it is turned down to load the belt.

## Quarry Illumination

AT THE QUARRY of the Weston and Brooker Co., at Camak, Ga., which was opened up last year to supply stone to the company's new crushed-stone plant, advantage was taken of the tall Georgia pine trees that surround the quarry. These trees are used to support the flood lights that illuminate the quarry for night work. The illustration shows how one of the lights was mounted in a tree with a ladder for inpection.

***Tall pine makes convenient light pole***

# Rock Products Clinic

## On the Need of Unity of Action by the Aggregate Industry

THE EDITOR: I have read with most interest your editorial in the issue of September 24, under the caption "A United Mineral Aggregate Industry?" I think the facts are entirely as you state them. I was always in favor of more cooperation between the two branches of the industry, but a majority of the members of the crushed stone association were not so inclined. Their local situations largely influenced their judgment in this matter. Here in Wisconsin it seemed most advantageous for the crushed stone producers to work in harmony with the sand and gravel producers, and to that end the Wisconsin Mineral Aggregate Association was formed at the conclusion of the war and the dissolution of the War Service Committee. The experience of working together during the war was largely responsible for wishing to continue. This association continued to function until hit by the depression and low prices in 1930.

A. J. BLAIR.

* * * * *

Mr. Blair was the first president of the National Crushed Stone Association. He was also a member of the Mineral Aggregates War Service Committee. More than that he was, also, if our recollection is correct, the first president of the Wisconsin Mineral Aggregate Association.

—THE EDITOR.

* * * * *

THE EDITOR: I read with a good deal of interest your editorial of September 24. It certainly goes quite thoroughly into the history of the two associations, and it is most interesting reading to me, and I trust it may be to other members who may not be as familiar with the facts.

So far as my own interest in the creation of one association is concerned, it dated from the War Service Committee, and I remember distinctly at the last meeting of that committee, I felt out most of the 13 members who were present and discussed the possibilities of one association. At that time I found the same competitive state of mind which exists today, and after the subject was discussed by one or two of us who were interested, we decided it was not then the time to undertake to put over one association. As a matter of fact it probably was the time, and with energetic promotion I feel now it could have been done.

JOHN PRINCE.

* * * * *

Mr. Prince is a past-president of the National Sand and Gravel Association, and was a member of the Mineral Aggregate War Service Committee.

The above comments were not solicited for publication and were contained in personal letters to the editor, but the editor feels certain the writers will not object to being quoted, and their thoughts are certainly of general interest to the industry.

### *An Invitation!*

***THE BIGGEST PROBLEM** that has faced the rock products construction materials industry in many a day is the saving of the highway industry.*

*Rock Products has already devoted many columns to this subject—has attempted in every way to supply arguments and inspiration to fight gasoline tax diversion and to maintain popular interest in a continuation of highway construction programs.*

*In this issue is described the very specific way producers in New York State are meeting the issue.*

*In the issue of September 24 we dwelt at length on the past history of the mineral aggregate associations and their various efforts, more or less successful, to act harmoniously.*

*The editor has already received letters from several outstanding producers, commenting on the situation. He would like to hear from others.*

*For the editor feels certain that the industry can derive much benefit from a frank discussion of issues now, so that they may be nearer crystallized by the time of the Detroit conventions, next January. May we have your ideas?*

*—The Editor.*

## Lime as an Explosive

THE EDITOR: In reply to your query on page 46 of the September 10 issue of ROCK PRODUCTS, may I call your attention to the paragraph on page 5 of the inclosed circular, regarding the use of lime in quarrying fragile material. It may be of interest to your correspondent.

H. HERBERT HUGHES,
U. S. Bureau of Mines.

The paragraph referred to is to be found in Information Circular No. 6468, published July, 1931, entitled "Iceland Spar and Optical Fluorite," and reads as follows:

"An interesting departure from conventional quarrying methods is the use of unslaked lime rather than explosives in breaking the rock surrounding the crystals. This procedure eliminates the danger of fracturing the spar by blasting. The method itself is simple. Three or 4 in. of unslaked lime is tamped in the bottom of a hole drilled a short distance from the crystals. A slender iron rod or wire is inserted into the hole, and lime is packed around it to within 2 in. of the top by means of a curved tamping bar. The rod is then removed, and a cotton string saturated with water is dropped into the hole so that the end is suspended about half an inch off the bottom. The opening of the hole is then sealed with clay or some other similar material. The water dripping from the string causes expansion of the lime which bursts the rock with a minimum of damage to the spar. This method was suggested to the bureau in 1929 by Oscar H. V. Berghland, of California."

## Ohio Lime Manufacturer Distributes Through Dealers

THE EDITOR: Some of our competitors have called our attention to a news item under the heading "Lime," page 69, September 10 issue of ROCK PRODUCTS, to the effect that our company has established trucking service on agricultural lime and is delivering direct to farmers in lots of five to 20 tons.

This item is in error and we wish that you would correct it. Our company has always been opposed to a policy of engaging in the retail business.

We are engaged principally in producing plastic products required in construction; in fact, we make all the plastic products so required with the exception of portland cement. A short time ago it was decided to eliminate trucking to all points in Michigan, and the Ohio dealers have proposed to buy in carload lots and suggested to manufacturers to let them handle the trucking in a like manner.

The same principle applies in handling our agricultural business. We sell dealers in carload quantities and the dealers in turn serve the consuming trade in truckload or L.C.L. quantities. It is true that we have some dealers in Ohio who send their trucks to our plant and deliver agricultural products by truck direct to the consuming trade. This is done to meet competition. Our company has no trucking facilities to serve the consuming trade and has never followed a policy of selling lime direct to farmers and making deliveries in our own trucks.

In conclusion, we might say that we believe that the dealer is an essential factor in our business to make sales, carry a stock of our products, and serve the consuming trade promptly when materials in our line are required. Our company has never given any thought of eliminating the dealer or of doing anything in the conduct of our business which in any way might reflect on the well being of the dealers' activities.

FRED WITMER,
President, The Ohio Hydrate and Supply Co.

# Editorial Comment

**Promotion of Goodwill**

Elsewhere in this issue, in the report of the proceedings of the National Safety Congress, is a very excellent address by E. J. Mehren, president of the Portland Cement Association, on what organized safety work has done for the cement industry in the promotion of goodwill. He very accurately appraises goodwill as a byproduct of doing the right thing, the humanitarian thing, for the industry's employes. Goodwill is something very intangible, but very real, which can not be bought or achieved wholly by direct methods; in the final analysis it is always more or less the byproduct of a fair deal.

Mr. Mehren's address is particularly apropos and should not be passed over by any producer because it comes under the heading of "Safety"—a subject that many readers have come to consider is about worn out and beyond the reach of *new* ideas. For the highway construction material industries right now are engaged in the biggest bid for goodwill ever tried. They are attempting to do it locally, as the New York State Construction Council, and on a national scale as the coming Highway and Building Congress.

In these ambitious attempts to influence public opinion—to win the public's goodwill and help—it should be borne in mind that publicity and a grand hullabaloo alone will accomplish little or nothing. Back of these must be entire honesty and frankness coupled with a sincere desire to render genuine public service. Essentially, and no one can deny it, they are the movements of selfish interests designed primarily to preserve those selfish interests. The New York State Construction Council is proceeding along just such a direct line.

There is nothing in that to be ashamed of. All business and industry is essentially selfish. No one expects it to be philanthropic. Our intense nationalism is selfish in the same sense. We all wish the rest of the world well, but wishing the world well, we know will not clothe and feed our American compatriots, or the members of our own households. We have to be practical, and to be practical is to be selfish. So we have tariff walls and other incumbrances to foreign trade.

Therefore, we hope all wholesale attempts to win the public's goodwill will not be marred and discounted by insincere professions of the "unselfishness" of the would-be promoters of goodwill. For whatever goodwill results can be only a *byproduct* of a genuine effort to serve the public. And there is nothing incompatible between a sincere desire to serve the public and the promotion of sane selfish interests, provided we go about it in an open-handed honest way. Because the American public interest is nothing more nor less than the summation of the selfish interests of the various groups forming the American public, properly and justly balanced.

So, as organized safety work, entered into in many instances from selfish motives to save the cost of accidents and excessive insurance premiums, has resulted in a by-product of goodwill, so will an effort to establish goodwill for the construction industry succeed if the real objective is worthy, free of buncombe and industriously pursued. The test is the genuineness of the service rendered rather than the motives which prompted it.

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**Trucks vs. Railroads**

The railway problem is rapidly coming to a crisis. The appointment of a commission headed by ex-President Coolidge to act for the holders of several billion dollars of railway corporation bonds (insurance companies, schools, colleges, hospitals, savings banks, etc.) is of much greater significance than many people realize. At the same time the motor vehicle industry is organizing to fight further taxation, direct or indirect, of motor trucks. Many producers are inclined to favor the motor truck industry in the belief that the future of highway construction is involved in this controversy.

Perhaps the roadbuilding interests should be definitely allied with the motor truck industry. But certainly it is no matter for snap judgment. Aside from the fact that the railways under normal conditions are large users of cement and aggregates, or ballast, and that the great bulk of these commodities are still dependent on the railways for distribution, some very large issues of public policy are involved.

The Interstate Commerce Commission has estimated that in 1929 about 1,300,000 motor trucks carried about 4.2% of the total freight volume of the country for that year. During the same period the railways carried 72.9% of the total volume. These figures and others have been analyzed to prove that it cost an average of 15c per revenue ton-mile to move freight by truck as against 1c per ton-mile by railway. Thus to move freight by truck, even under present conditions, is not cheap. Other reasons, of course, exist to favor truck freight movement.

It is obvious in view of these figures that the railways are not in danger of being outclassed as the more economical of the two methods of transportation, even though trucks are not required to pay more for building and upkeep of highways. Each method of transportation has its rightful place, and that place can be determined, and the two coördinated. If the railways cannot hold their rightful share of the long-haul traffic without further taxation of trucks, it may be good public policy to increase truck taxes, irrespective of economic arguments. The railways must be preserved for the safety and security of every citizen; and someone must pay the costs of highway construction and maintenance. It would seem we have exhausted the possibilities of the general property tax and the gasoline tax; to increase taxes on pleasure vehicles or to increase taxes on revenue freight and passenger carriers seem to be the only alternatives. Take your choice. To us it seems more fair and better public policy to increase taxes on those who use the public highways for profit.

# Financial News and Comment

## RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

| Stock | Date | Bid | Asked | *Dividend |
|---|---|---|---|---|
| Allentown P. C. 1st 6's[47] | 10- 4-32 | 95 | 100 | |
| Alpha P. C. com.[2] | 10- 3-32 | 9 | 12 | 25c qu. Apr. 25 |
| Alpha P. C. pfd.[2] | 10- 3-32 | 50 | 85 | 1.75 qu. Sept. 15 |
| Amalgamated Phos. 6's, '36[19] | 9-16-32 | 88½ | 92 | |
| American Aggregates com.[23] | 10- 4-32 | 1 | 3 | |
| American Aggregates pfd.[19] | 9-16-32 | 5 | 10 | 1.75 qu. Jan. 1 |
| Amer. Aggr. 6's, w.w.[27] | 10- 3-32 | 33 | ..... | |
| Amer. L. & S. 1st 7's[27] | 10- 4-32 | 50 | ..... | |
| Arundel Corp. com. | 10- 1-32 | 21 actual sale | | 75c qu. Oct. 1 |
| Bessemer L. & C. Class A[4] | 9-30-32 | ..... | 4 | |
| Bessemer L. & C. 1st 6½'s[4] | 9-30-32 | 23 actual sale | | |
| Bloomington Limestone 6's[27] | 10- 4-32 | No market | | |
| Boston S. & G. new com.[37] | 9-30-32 | 2½ | 4½ | 5c qu. July 1 |
| Boston S. & G. new 7% pfd.[37] | 9-30-32 | 17 | 25 | 87½c qu. Oct. 1 |
| Boston S. & G. 7's, 1934[19] | 9-16-32 | 55 | 60 | |
| California Art Tile, A | 10- 1-32 | 1½ | 4¼ | |
| California Art Tile, B[9] | 10- 1-32 | ..... | 4 | |
| Calaveras Cement com. | 9-30-32 | ..... | 2¼ | |
| Calaveras Cement 7% pfd. | 9-30-32 | ..... | 50 | 1.75 qu. Oct. 15 |
| Canada Cement com. | 10- 3-32 | 4¼ | 4⅞ | |
| Canada Cement pfd. | 10- 3-32 | 29½ | ..... | 1.62½ qu. June 30 |
| Canada Cement 5½'s[34] | 9-30-32 | 80½ | 81½ | |
| Canada Crushed Stone bonds[34] | 9-30-32 | 63 | ..... | |
| Canada Crushed Stone com.[42] | 9-15-32 | 1 | ..... | |
| Certainteed Products com. | 10- 1-32 | 2⅝ actual sale | | |
| Certainteed Products pfd. | 10- 3-32 | 8 | 14 | 1.75 qu. Jan. 1 |
| Certainteed Products 5½'s | 10- 1-32 | 43 actual sale | | |
| Cleveland Quarries | 10- 4-32 | ..... | 30 | 10c qu. Sept. 1 |
| Consol. Cement 1st 6½'s, A[44] | 10- 4-32 | No market | | |
| Consol. Cement pfd.[27] | 10- 4-32 | No market | | |
| Consolidated Oka Sand and Gravel (Canada) 6½'s[12] | 9-30-32 | 50 | 60 | |
| Consolidated Oka Sand and Gravel (Canada) pfd.[42] | 9-15-32 | ..... | 50 | |
| Consol. Rock Prod. com.[35] | 9-29-32 | 10c | 15c | |
| Consol. Rock Prod. pfd.[35] | 9-29-32 | 50c | 1 | |
| Consol. Rock Products units[35] | 9-29-32 | 1 | 2 | |
| Consol. S. & G. pfd. (Can.) | 10- 3-32 | ..... | 50 | 50c qu. Aug. 15 |
| Construction Mat. com. | 10- 3-32 | ¼ | 1 | |
| Construction Mat. pfd. | 10- 3-32 | 2¼ | 4½ | |
| Consumers Rock and Gravel, 1st Mtg. 6's, 1948[35] | 9-29-32 | 32 | 36 | |
| Coosa P. C. 1st 6's[27] | 10- 4-32 | 15 | ..... | |
| Coplay Cem. Mfg. pfd.[47] | 10- 4-32 | 6 | 9 | |
| Coplay Cem. Mfg. 6's, 1941[47] | 10- 4-32 | 40 | 50 | |
| Dewey P. C. com.[47] | 10- 4-32 | 80 | 90 | |
| Dolese and Shepard | 10- 3-32 | 14 | 16 | $1 qu. Jan. 1 |
| Dufferin Pav. & Cr. Stone pfd. | 10- 3-32 | ..... | 26 | 1.75 qu. Apr. 1 |
| Dufferin Pav. & Cr. Stone com. | 10- 3-32 | ..... | 5 | |
| Edison P. C. com.[47] | 10- 4-32 | 4 | 6 | |
| Edison P. C. pfd.[47] | 10- 4-32 | 5 | 10 | |
| Federal P. C. 6½'s[47] | 10- 4-32 | 55 | 65 | |
| Giant P. C. com.[2] | 10- 3-32 | 2 | 5 | |
| Giant P. C. pfd.[2] | 10- 3-32 | 5 | 10 | |
| Gyp. Lime & Alabastine, Ltd. | 10- 3-32 | 3¼ | 3½ | |
| Gyp. Lime & Alabastine 5½'s[34] | 9-30-32 | 58 | 61 | |
| Hermitage Cement com.[31] | 9-17-32 | 2 | 5 | |
| Hermitage Cement pfd.[31] | 9-17-32 | 15 | 25 | |
| Ideal Cement 5's, 1943[29] | 10- 1-32 | 86 | 89 | |
| Ideal Cement com.[29] | 10- 3-32 | 14 | 16 | 25c qu. Oct. 1 |
| Indiana Limestone 6's | 10- 3-32 | 18⅞ actual sale | | |
| International Cem. com. | 10- 3-32 | 12¼ actual sale | | 50c qu. Mar. 31 |
| International Cem. bonds, 5's | 10- 1-32 | 65½ actual sale | | Semi-ann. int. |
| Keiley Island L. & T. | 10- 4-32 | 10 | 11 | 25c qu. Oct. 1 |
| Ky. Cons. Stone com.[45] | 9-29-32 | 1 | 2 | |
| Ky. Cons. Stone 7% pfd.[45] | 9-29-32 | 10 | 15 | |
| Ky. Cons. Stone 1st Mtg. 6½'s[45] | 9-29-32 | 15 | 18 | |
| Ky. Cons. St. V. T. C.[45] | 9-29-32 | 1 | 2 | |
| Ky. Rock Asphalt com. | 10- 3-32 | ¾ | 1⅛ | |
| Ky. Rock Asphalt pfd. | 10- 3-32 | ..... | 25 | |
| Ky. Rock Asphalt 6½'s | 10- 3-32 | 57 | 62½ | |
| Lawrence P. C.[2] | 10- 3-32 | 9 | 13 | |
| Lawrence P. C. 5½'s, 1942[2] | 10- 3-32 | 33 | ..... | |
| Lehigh P. C. com. | 10- 3-32 | 8⅛ actual sale | | |
| Lehigh P. C. pfd. | 10- 3-32 | 55 | 65 | 1.75 qu. Oct. 1 |
| Louisville Cement[7] | 9-29-32 | 60 | 80 | |
| Lyman-Richey 1st 6's, 1935[18] | 9-30-32 | 85 | 95 | |
| Marbelite Corp. com.[35] (cement products) | 9-29-32 | 5c | 75c | |
| Marbelite Corp. pfd.[35] | 9-29-32 | 50c | ..... | |
| Marquette Cement com.[47] | 10- 4-32 | 5 | 7 | |
| Marquette Cement pfd.[47] | 10- 4-32 | 50 | 55 | 1.50 qu. Oct. 1 |
| Marquette Cem. Mfg. 1st 5's, 1936[46] | 10- 4-32 | 70 | ..... | |
| Marquette Cem. Mfg. 1st 6's, 1936[46] | 10- 4-32 | 75 | ..... | |
| Material Service Corp. | 10- 3-32 | 4 | 8 | |
| McCrady-Rodgers 7% pfd.[22] | 9-29-32 | 25 | 30 | 87½c qu. June 30 |
| McCrady-Rodgers com.[22] | 9-29-32 | No market | | 75c qu. Jan. 26 |
| Medusa P. C. pfd.[47] | 10- 4-32 | 42 | 48 | 1.50 qu. Apr. 1 |
| Medusa P. C. com.[47] | 10- 4-32 | 6 | 8 | |
| Monarch Cement com.[47] | 10- 4-32 | 55 | 60 | |
| Michigan L. & C. com.[6] | 10- 1-32 | 45 | ..... | |
| Missouri P. C. | 10- 3-32 | 7 | 9 | 25c qu. Jan. 30 |
| Monolith Portland Midwest[9] | 10- 1-32 | 60c | 90c | |
| Monolith P. C. com.[9] | 10- 1-32 | 1 | 1¼ | 40c s.-a. Jan. 1 |
| Monolith P. C. pfd.[9] | 10- 1-32 | 1¼ | 1½ | 40c s.-a. Jan. 1 |
| Monolith P. C. units[9] | 10- 1-32 | 3½ | 4¼ | |
| Monolith P. C. 1st Mtg. 6's[9] | 10- 1-32 | 35 | 40 | |
| National Cem. (Can.) 1st 7's[27] | 10- 4-32 | 75 | 85 | |
| National Gypsum A com.[27] | 10- 4-32 | 2 | 3 | |
| National Gypsum pfd.[27] | 10- 4-32 | 29 | ..... | 1.75 qu. Oct. 1 |
| National Gypsum 6's[8] | 10- 4-32 | 70 | 73 | |
| National L. & S. 6½'s, 1941[19] | 9-16-32 | 70 | 75 | |
| Nazareth Cement com.[47] | 10- 4-32 | 3 | 6 | |
| Nazareth Cement pfd.[47] | 10- 4-32 | 30 | 40 | |
| Newaygo P. C. 1st 6½'s[27] | 10- 4-32 | 80 | 90 | |
| New England Lime 6's, 1935[14] | 9-30-32 | No market | | |
| N. Y. Trap Rock 1st 6's | 10- 3-32 | 67¾ actual sale | | |
| N. Y. Trap Rock 7% pfd.[27] | 10- 4-32 | ..... | 60 | 1.75 qu. Oct. 1 |
| North Amer. Cem. 1st 6½'s | 10- 3-32 | 30 actual sale | | |
| North Amer. Cem. com.[27] | 10- 4-32 | No market | | |
| North Amer. Cem. 7% pfd.[27] | 10- 4-32 | ¾ | ..... | |
| North Shore Mat. 1st 6's[15] | 10- 4-32 | ..... | 35 | |
| Northwestern States P. C.[47] | 10- 4-32 | 25 | 30 | |
| Ohio River S. & G. com. | 10- 3-32 | ..... | 5 | |
| Ohio River S. & G. 1st pfd. | 10- 3-32 | ..... | 50 | |
| Ohio River S. & G. 6's[16] | 9-17-32 | 25 | 50 | |
| Oregon P. C. com.[9] | 10- 1-32 | 8 | 12 | |
| Oregon P. C. pfd.[9] | 10- 1-32 | 80 | 85 | |
| Pacific Coast Aggr. com.[40] | 9-29-32 | ..... | ½ | |
| Pacific Coast Aggr. pfd.[40] | 9-29-32 | ..... | 1 | |
| Pacific Coast Aggr. 6½'s, 1944[5] | 9-30-32 | 12 | 14 | |
| Pacific Coast Aggr. 7's, 1939[5] | 9-30-32 | 4 | 6 | |
| Pacific Coast Cement 6's[5] | 9-30-32 | 42 | ..... | |
| Pacific P. C. com. | 9-30-32 | 3 | ..... | |
| Pacific P. C. pfd.[5] | 9-30-32 | 30 | 32 | 1.62½ qu. Oct. 5 |
| Pacific P. C. 6's, 1934 | 9-30-32 | 80 | ..... | |
| Pacific P. C. 6's, 1935 | 9-30-32 | ..... | 94 | |
| Pacific P. C. 6's, 1936 | 9-30-32 | 75 | 94 | |
| Peerless Cement com.[1] | 9-30-32 | 25c | 50c | |
| Peerless Cement pfd.[1] | 9-30-32 | 5 | 10 | |
| Penn.-Dixie Cement com. | 10- 3-32 | 1½ actual sale | | |
| Penn.-Dixie Cement pfd. | 10- 3-32 | 7¼ | 12 | |
| Penn.-Dixie Cement 6's | 10- 1-32 | 47⅛ actual sale | | |
| Penn. Glass Sand Corp. pfd.[27] | 10- 4-32 | 40 | 50 | 1.75 qu. Apr. 1 |
| Penn. Glass Sand Corp. 6's[19] | 9-16-32 | 72½ | ..... | |
| Petoskey P. C. | 10- 3-32 | 2¼ | 2¾ | |
| Port Stockton Cem. com.[9] | 10- 1-32 | No market | | |
| Riverside Cement com.[9] | 10- 1-32 | ..... | 10 | |
| Riverside Cement pfd.[9] | 10- 1-32 | 38 | 42 | 1.50 qu. Aug. 1 |
| Riverside Cement, B[9] | 10- 1-32 | 70c | 1 | |
| Roquemore Gravel 6½'s[17] | 8-20-32 | 75 | ..... | |
| Sandusky Cement 6½'s, 1932-37[27] | 10- 4-32 | 70 | 80 | |
| Sandusky Cement 6's[19] | 9-16-32 | 80 | ..... | |
| Santa Cruz P. C. com. | 9-30-32 | ..... | 65 | $1 qu. Oct. 1 |
| Schumacher Wallboard com. | 9-30-32 | 1.10 | ..... | |
| Schumacher Wallboard pfd. | 9-30-32 | 3 | ..... | 50c qu. May 15 |
| Signal Mt. P. C. pfd.[47] | 10- 4-32 | 3 | 6 | |
| Southwestern P. C. units[47] | 10- 4-32 | 150 | 175 | |
| Southwestern P. C. com.[47] | 10- 4-32 | 30 | 35 | |
| Southwestern P. C. pfd.[47] | 10- 4-32 | 65 | 70 | $2 qu. July 1 |
| Standard Paving & Mat. (Canada) com. | 10- 3-32 | 1¾ | 2 | |
| Standard Paving & Mat. pfd. | 10- 3-32 | ..... | 35 | 50c qu. Aug. 15 |
| Superior P. C., A | 9-30-32 | 30 | 31 | 27½c mo. Nov. 1 |
| Superior P. C., B | 9-30-32 | 7 | 8¼ | 12½c Oct. 20 |
| Trinity P. C. units[47] | 10- 4-32 | 35 | 40 | |
| Trinity P. C. com.[47] | 10- 4-32 | 7 | 10 | |
| Trinity P. C. pfd.[47] | 10- 4-32 | 30 | 35 | |
| U. S. Gypsum com. | 10- 3-32 | 24 | 25 | 40c qu. Oct. 1 |
| U. S. Gypsum pfd. | 10- 3-32 | 101 | ..... | 1.75 qu. Oct. 1 |
| Wabash P. C.[21] | 9-16-32 | 5 | 9 | |
| Warner Co. com.[27] | 10- 4-32 | 2¾ | 3½ | |
| Warner Co. 1st 7% pfd.[27] | 10- 4-32 | 15 | 20 | 1.75 qu. Apr. 1 |
| Warner Co. 6's, 1944, w. w. | 9-30-32 | 30 | 40 | |
| Whitehall Cem. Mfg. com.[47] | 10- 4-32 | 25 | 30 | |
| Whitehall Cem. Mfg. pfd.[47] | 10- 4-32 | 45 | 50 | |
| Wiscon. L. & C. 1st 6's, '33[15] | 10- 4-32 | 30 | ..... | |
| Wolverine P. C. com. | 10- 3-32 | ¾ | 3¼ | |
| Yosemite P. C., A com.[9] | 10- 1-32 | 90c | 1.10 | |

*Latest 1932 dividend.

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Wick & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central-Republic Bk. & Tr. Co., Chicago. [16]G. M. P. Murphy & Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]Howard R. Taylor & Co., Baltimore. [24]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher-Newton & Co., Denver. [30]Hanson and Hanson New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomson & Co., Toronto. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky. [46]First Union Trust & Savings Bank, Chicago. [47]Anderson Plotz and Co., Chicago, Ill. [48]Hemphill, Noyes and Co., New York City.

## Predicts U. S. Gypsum Will Nearly Earn 1932 Dividends

OPERATIONS for United States Gypsum Co., Chicago, Ill., are no longer on the downward trend which has characterized the last two years, according to the Dow Jones News Service, in the *Wall Street Journal* (New York City). At present the company's operations and profits appear to be moving horizontally. There has been some improvement in light construction in the last two months and a further pickup is anticipated this fall. On the basis of the second half showing to date, profits for this period should equal those of the first half, and if further anticipated improvement materializes the second half profits might well show an increase over the first half.

On the basis of earnings already realized, net profit for the full current year will approximate $1,900,000, equivalent, after providing for preferred dividends, to around $1.15 a share on the 1,218,349 common shares outstanding on June 30. In the first six months of this year Gypsum's net amounted to $963,789, or 57 c. a common share, against $2,241,560, or $1.62 a share on 1,216,956 shares in the first half of 1931. For the full year 1931 the company's net was $3,563,143, or $2.48 a share on 1,217,472 common shares.

### *Operations at 17% of Capacity*

On the basis of the indicated profit showing for 1932 it will be necessary for the company to dip into surplus to the extent of around $500,000 for common dividends, which have been continued at the regular rate of 40 c. quarterly. However, with earned surplus of about $21,000,000 and with cash and government securities of nearly $12,000,000, it can easily make this distribution.

U. S. Gypsum is operating now at about 17% of capacity. During the summer its operations were around 15%, which was the low point for the present slump.

On September 1 the company added three new products to its wall board line. One of these, which has met with very good demand considering the short time it has been on the market, embodies a new principle of insulation. It is the regular "Sheet Rock" wall board, one side of which is covered with aluminum foil. This wall covering is said to be equivalent by actual test to a layer of conventional insulating board plus the Sheet Rock.

### *Yield on Government Securities*

U. S. Gypsum's research department found that the polished aluminum surface will not only reflect light rays without converting them into heat, but that it also will reflect heat rays without transmitting them.

The other two items are a wood veneered Sheet Rock and a grain board which is a likeness of wood lithographed on the paper covering of wall board.

A portion of U. S. Gypsum's profits represents interest on its government securities. This return is nearly enough to cover preferred dividends and has been an important factor in insuring continuous profits during the decline in operations.

Gypsum paper filler, which was introduced early in the year, has consistenly shown improvement in sales volume, despite the decline this year in the paper industry. While profits from this department are not large, they have partly offset the decline in other departments due to decrease in demand for building materials.

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## Annual Report of the Zonolite Co.

ZONOLITE is the trade name of a vermiculite product—vermiculite, as has been described in previous issues of Rock Products, is a micaceous mineral which on proper heat treatment forms a flaky aggregate of very low apparent specific gravity. The Montana vermiculite developed by the Zonolite Co. was the first to be placed on the market. The following report on the operations of the Zonolite Co. for the fiscal year ending June 30, 1932, gives quite a history of recent developments of the product, in addition to the financial status of the company:

"At the annual meeting on July 28, 1931, B. D. White, vice-president of the Zonolite Co., was authorized to arrange for the construction and operation of a Zonolite heat-processing plant in the vicinity of Chicago. This he accomplished by interesting F. E. Schundler and Co., of Joliet, Ill., in the expanding and sale of Zonolite. The Zonolite Co. has entered into a contract with Mr. Schundler, whose Zonolite operations are carried on under the name of 'The Zonolite Products Co.' This contract covers the exclusive distribution of Zonolite in the United States east of the Mississippi river. The Zonolite Products Co., after the expenditure of several thousand dollars in experimental work, developed an ideal type of individual expanding unit which is now in operation in Joliet, Ill., and in Brooklyn, N. Y. This unit is compact and can be installed at reasonable cost. Installations of plants by the Zonolite Products Co. and by sub-agents in other distribution centers throughout the eastern states are under way. Wherever tonnage requirements warrant, an expanding plant will be erected at the factory of any customer or user. The construction of units in Cleveland and Pittsburgh is now specified.

"The territory west of the Mississippi is being developed by agencies established by the Zonolite Sales Co., of which B. D. White is the president and general manager. A contract has been entered into between the Zonolite Co. and the Zonolite Sales Co. authorizing the latter company to promote sales and establish agencies. The policy under which this development work is being carried out is to contract with well-financed, old-established firms for comparatively small territories and reasonable annual minimum purchases. Manufacturers and dealers in building materials are given the preference. Each agent is expected to erect one of the new type expanding units and to purchase Zonolite in the crude form for expansion in the agent's own territory.

"This plan has involved several changes in plant operations at Libby, Mont. It has been found that certain sizes of the crude mineral are a suitable size after expansion for specified purposes, such as in insulating plaster, for bulk insulation and dry fill purposes, and in the manufacture of insulation boards and slabs. To produce these sizes the Zonolite Co. has installed a new set of special screens for sizing the crude Zonolite and has built three new bins for storage of the crude in its different textures. Hereafter the crude Zonolite will be passed through the rotary kiln at a low heat to drive off the free moisture. It will then be passed through the new screens to produce the sizes determined upon.

"In connection with the sizing of the crude Zonolite it was necessary to purchase and install a pulverizer for breaking down the coarsest Zonolite. This installation necessitated the purchase of a 5-hp. motor and the building of an additional bin.

"The advantages of this system of operation are many. Freight rates on crude Zonolite are lower than on the heat-treated. Furthermore, the elimination of all free moisture, which occasionally runs as high as 10%, means that the agent is not obliged to pay freight on moisture which is of no value to him and which is also included in our invoice weights. Moreover, the initial sizing and screening of the crude Zonolite before shipment obviates the necessity of installing pulverizers or crushers and screening assemblies at each expanding plant. Smaller warehouse facilities are required for the storage of the crude mineral as compared with the expanded Zonolite. This is an important item in cutting down the overhead costs to agents and manufacturers.

"The Zonolite Sales Co. has been active for the past three months and has already attained substantial results. An agency contract has been proposed for eastern Missouri with a well-financed firm in the building materials supply business in St. Louis, to whom car-lot shipments have been made. Contracts have been about concluded for Springfield and Joplin, Mo., and for Tulsa and Oklahoma City, Okla. Other contracts will soon be in effect in Minneapolis and St. Paul, Minn., and for Omaha and Nebraska City, Neb. At Nebraska City an expanding plant is already operating and carload shipments of crude Zonolite have been made to that point. Still another agency has been authorized for the state of California. All these contracts are and will be directly between the Zonolite Co. and the agents, the Zonolite Sales Co. negotiating the contracts and servicing the agencies. Mr. White and his Zonolite Sales Co. organization will devote

their entire time to the creation of agencies in uncontracted territories in the United States west of the Mississippi river and to the servicing of the agencies and their expanding plants.

"While tonnages shipped into Canada were not as large as had been anticipated, on account of the unfavorable business conditions, the Zonolite Co.'s representatives in the Dominion have erected an expanding plant in eastern Canada within the past six months. This new plant, together with the plant which has been in operation in Calgary for several years, will provide an outlet for considerable tonnages of crude Zonolite during the present fiscal year.

"Several new carload customers were secured during the past year and several new uses for Zonolite were developed commercially, among them an acoustic panel of considerable merit; a slab or board for cold insulation; and a roofing composition which has proven its merit in actual use.

"Several local dealers in Montana have undertaken the distribution of Zonolite, and, as a large proportion of the Zonolite Co.'s stockholders are Montana residents, it will doubtless be of interest to them to know that the following companies are distributing Zonolite in this state:

"Artificial Ice and Cold Storage Co., Billings.

"Grogan-Robinson Lumber Co., Great Falls.

"Home Lumber Yards, Whitefish.

"Interstate Lumber Co., Helena.

"Kenyon-Noble Lumber Co., Bozeman.

"Sullivan Valve and Engineering Co., Butte.

"Negotiations are under way at the present time with prospective distributors in Kalispell, Cut Bank, Shelby, Dillon and Missoula.

"Montana sales have developed satisfactorily during the past six months and this is entirely due to the carriers finally granting reasonable carload freight rates within the state. "Class D" carload rates are now effective on all lines in Montana on expanded Zonolite.

"Other freight rate reductions have been published which are having a considerable share in the development of markets all over the United States. The rate on crude Zonolite to Chicago territory has been reduced from $12 per ton to $10; to the Twin Cities the rate has been reduced from $12 to $8 per ton; and a reduction of $3 per ton has been granted on crude Zonolite shipped to all points in tariff groups B, C and C-1, which include large areas in the states of Kentucky, New York, Pennsylvania, West Virginia and Michigan, and the entire states of Ohio and Indiana.

"Applications for still lower all-rail rates on crude Zonolite, as well as for combination rail-lake rates to eastern points, have been filed, and material reductions are anticipated.

"Several other improvements and additions have been made to the plant in Libby. The house track through the plant was lowered in order to permit the switching of the largest automobile freight cars through the plant.

"A financial statement is appended to this report. It will be noted that an operating loss of about $1300 is charged off. This deficit was the result of expenses in connection with the development of markets and establishment of agencies throughout the east and south central states. During the next fiscal year such expenses will be met entirely by the Zonolite Products Co. and the Zonolite Sales Co. The latter company will be reimbursed on a royalty or commission basis on all tonnage purchases effected through its efforts.

"The financial statement does not show a most significant and encouraging fact: the tonnages sold during the fiscal year just ended were 50.4% greater than in the previous fiscal year, with an attending increase of 44.06% in money returns on sales."

## New Plan for Selling Agricultural Limestone in Illinois

ORGANIZED BUYING of agricultural limestone by 60,000 Farm Bureau members in Illinois will be continued in the future through the Agricultural Limestone Co., a newly organized subsidiary of the Illinois Agricultural Association, and the County Farm Bureaus, the Bureau County Farm Bureau announces.

An agreement has been reached between the Agricultural Limestone Co. and the limestone producers under which Farm Bureau members will receive the advantages of organized volume buying. The principal difference between the new plan and the old is that hereafter quarry operators will quote prices to the County Farm Bureaus direct and the latter will place their orders with the limestone company offering the best terms and service. Farmers who pay cash within 15 days from date of invoice will receive a 10 c. per ton discount.

The new proposal involves no commission or payment to the Illinois Agricultural Association or Agricultural Limestone Co., although the latter will act as disbursing agent in distributing refunds to the counties. The advantages of organized buying enjoyed by Farm Bureau members since the Illinois Agricultural Association was organized on its present basis in 1919 will be preserved in spite of the fact that the limestone-phosphate department of the association has been discontinued.—*Princeton* (Ill.) *Republican.*

## Recent Dividends Announced

| | | | |
|---|---|---|---|
| Boston Sand and Gravel 7% pfd. (qu.) | $0.87½, | Oct. | 1 |
| Marquette Cement Mfg. 6% pfd. (qu.) | 1.50 | Oct. | 1 |
| Pacific Portland Cement pfd. (qu.) | 1.62½, | Oct. | 5 |
| Superior Portland Cement Cl. A (mo.) | 0.27½, | Nov. | 1 |
| Superior Portland Cement B (qu.) | 0.12½, | Oct. | 20 |

THE ZONOLITE CO., LIBBY, MONT.—BALANCE SHEET, JUNE 30, 1932

| ASSETS | | |
|---|---|---|
| Capital assets: | | |
| Mining property | | $361,000.00 |
| Mine development | | 46,190.31 |
| Mining machinery and equipment | | 182.10 |
| Plant buildings | | 13,169.73 |
| Plant equipment | | 25,903.46 |
| Real estate | | 383.75 |
| Office furniture and fixtures | | 1,102.85 |
| Trucks and autos | $1,262.90 | |
| Less: Reserve for depreciation | 565.20 | 697.70 |
| Total capital assets | | $448,629.90 |
| Current assets: | | |
| Cash on hand | $ 1.00 | |
| First National Bank, Kalispell | 630.56 | |
| Accounts receivable | 2,991.35 | |
| Inventory (at cost) | 2,789.50 | |
| Total current assets | | $ 6,412.41 |
| Prepaid expense: | | |
| Inventory—Oil, etc. | $ 524.02 | |
| Insurance prepaid—Fire | 47.39 | |
| Total prepaid expense | | $ 571.41 |
| Other assets: | | |
| Experimental and trade development expense | $ 1.00 | |
| Due from officers | 2.59 | |
| Due on stock subscriptions | 8,000.00 | |
| Total other assets | | $ 8,003.59 |
| Total | | $463,617.31 |

| CAPITAL AND LIABILITIES | | |
|---|---|---|
| Capital stock: | | |
| Capital stock authorized (450,000 shares of $1 each par value) | | $450,000.00 |
| Less: Stock unissued | | 82,129.00 |
| Stock issued and outstanding | | $367,871.00 |
| Stock subscription credit | | 250.00 |
| Surplus June 30, 1931 | $77,812.11 | |
| Less: Operating loss for year 1931-32 | 1,312.06 | 76,500.05 |
| Total capital and surplus | | $ 44,621.05 |
| Liabilities: | | |
| Payroll | $ 336.96 | |
| Accounts payable | 1,791.99 | |
| Notes payable to bank | 2,700.00 | |
| Notes payable to E. N. Alley | 8,800.00 | |
| Accrued interest payable to others | 38.35 | |
| Royalties payable | 464.25 | |
| Advance by F. E. Schundler and Co. | 1,760.50 | |
| Advance by Gypsum, Lime and Alabastine Co. | 500.00 | |
| Due to C. L. Emmons | 89.21 | |
| Due to B. D. White | 2,350.00 | |
| Accrued taxes—County and state (estimated) | 165.00 | |
| Total liabilities | | 18,996.26 |
| Total | | $463,617.31 |

## Recognition of Construction Industry Sought in Congress

THE ADVISABILITY of seeking the formation of a standing committee on construction in both houses of Congress, to which might be referred all legislation affecting the industry, is to be considered by the governing board of the Associated General Contractors of America at its fall meeting in Washington, October 10 and 11, Edward J. Harding, managing director of the association, announces.

Although under the present Congressional committee set-up there are at least 17 standing committees which regularly consider and frame legislation directly affecting the industry, Mr. Harding points out that there is in neither house a committee to consider the problems of construction as a whole.

"The depression more than anything else," Mr. Harding states, "has brought about a realization of the necessary integration of the construction industry and the interdependence of each branch upon the other. Recognizing this, it would certainly seem that Congress should provide means for considering the industry as a whole, as it has done with agriculture, banking, labor, the railroads and mining, by providing a standing committee dedicated to that purpose."

Closely related pieces of legislation affecting the industry frequently are simultaneously and independently considered by two or more committees of the same house, Mr. Harding states, whereas they should be considered in their relationships to each other and the entire industry.

He cited as an example the fact that at the last session of Congress the so-called Bingham-Goss bill, to require general contractors to list their subcontractors in their bids, was being considered by the House Committee on Expenditures in Executive Departments, headed by Representative John J. Cochran of Missouri, while at the same time the Carley bill, to provide for separate contracts with subcontractors, was before the House Committee on Public Buildings and Grounds, headed by Representative Fritz G. Lanham of Texas. Both of these measures involve a basic change in contractual relations, Mr. Harding states, while the field of activities of neither of the committees gives them the proper background to deal with the questions from the viewpoint of the entire industry. He further pointed out that the original Davis-Bacon Prevailing Wage Law emanated from the Senate Committee on Manufactures, whereas the Metcalf amendment to the measure subsequently was reported out by the Senate Committee on Education and Labor.

"The great advantage of the committee system of considering proposed legislation," Mr. Harding declares, "is the opportunity afforded committee members to become thoroughly familiar with the problems in a given field, but in so far as the construction industry is concerned, no group of men in Congress are at present being given that opportunity. As a result there has been much ill-advised and hodge-podge legislation affecting the industry."

The Associated General Contractors also intend to strongly support proposals for the creation of a Federal Department of Public works to consolidate and coordinate the Government's construction activities, which, if established, would practically necessitate the setting up of more comprehensive construction committees in Congress, Mr. Harding states.

## State Highway Construction in 1931 Almost a Billion Dollars

STATE HIGHWAY DEPARTMENTS expended $979,592,000 for state highway purposes last year, practically the same as in 1930, and their revenues last year for use on highways were $1,092,637,000, the U. S. Bureau of Public Roads stated as of September 22.

Of the revenues, the Bureau said, $640,795,000 was derived from taxation of motor vehicles and gasoline and from bridge tolls. The total amount of funds available to the states for use on highways during the year, including a balance of unexpended funds from 1930, was $1,367,970,000, it was stated, and of this total $276,961,000 remained unexpended at the end of the year.

New York and Pennsylvania led in amount of expenditures, according to a tabulation by the Bureau. The statement follows in full text:

The state highway departments expended a total of $979,592,000 for state highway purposes in 1931, according to data collected from state authorities by the U. S. Bureau of Public Roads. This is approximately the same amount as was expended in 1930.

The above expenditure was composed of $730,955,000 for construction and right-of-way, $160,980,000 for maintenance, $21,482,000 for equipment and machinery, $61,862,000 for interest on bonds and notes, and $4,313,000 for miscellaneous expenses.

Disbursements not classed as current expenditures for state highways were as follows: $57,278,000 principal payments on notes and bonds; $32,969,000 transfers to counties and other local authorities for roads, and $21,170,000 to meet obligations imposed by statutes for other than highway purposes.

The total state highway income during the year amounted to $1,092,637,000, composed of $696,167,000 from state revenue sources; $265,856,000 contributions from Federal and local sources, and $130,614,000 from the sale of bonds and notes.

Of the $696,167,000 derived from state sources, $55,372,000 was derived from direct property taxes, and from appropriations and miscellaneous sources based principally upon property taxation, and $640,795,000 or 92% was derived from taxation of motor vehicles and gasoline and bridge tolls.

A balance of unexpended funds carried over from the previous year, amounting to $275,334,000, raised the amount available for expenditure in 1931 to a total of $1,367,970,000. Of this sum $276,961,000 remained unexpended at the end of the year.

The total expenditures for state highways by states were as follows:

| | |
|---|---|
| Alabama | $ 13,115,856 |
| Arizona | 6,853,270 |
| Arkansas | 20,768,830 |
| California | 35,040,097 |
| Colorado | 10,517,966 |
| Connecticut* | 5,097,223 |
| Delaware | 2,927,305 |
| Florida | 11,766,632 |
| Georgia | 17,443,874 |
| Idaho | 6,500,986 |
| Illinois | 38.345,977 |
| Indiana | 19,171,371 |
| Iowa | 35,197,948 |
| Kansas | 17,246,434 |
| Kentucky | 22,952,577 |
| Louisiana | 47,217,124 |
| Maine | 11,472,116 |
| Maryland | 13,291,664 |
| Massachusetts | 14,477,269 |
| Michigan | 34,634,765 |
| Minnesota | 31,108,468 |
| Mississippi | 6,865,743 |
| Missouri | 39,514,339 |
| Montana | 7,146,019 |
| Nebraska | 13,621,625 |
| Nevada† | 1,510,167 |
| New Hampshire | 7,834,632 |
| New Jersey | 48.850,249 |
| New Mexico | 8,242,004 |
| New York | 70,004,295 |
| North Carolina | 20,429,402 |
| North Dakota | 5,806,743 |
| Ohio | 32,465,921 |
| Oklahoma | 14,777,159 |
| Oregon | 13,879,272 |
| Pennsylvania | 57,641,283 |
| Rhode Island | 6,061,183 |
| South Carolina | 26,256,666 |
| South Dakota | 8,702,714 |
| Tennessee | 37,978,619 |
| Texas | 41,204,463 |
| Utah | 6,349.873 |
| Vermont | 6,275,707 |
| Virginia | 20,601,382 |
| Washington | 15,597.588 |
| West Virginia | 20,774,991 |
| Wisconsin | 19,358,700 |
| Wyoming | 6,693,602 |
| Total | $979,592,093 |

*For six months period ended June 30, 1931.
†For seven months period ended June 30, 1931.

## Supplement to A. S. T. M. Standards

THE SECOND SUPPLEMENT to the 1930 book of the American Society for Testing Materials Standards has been issued and contains two revised specifications of interest to the rock products industry. The standard methods of testing cement (C77-30) were revised September 1, 1932, and now appear in their latest form in this supplement. The standard definitions of terms relating to materials for roads and pavements (D8-18) were revised September 1, 1932, by revision of the terms "bitumens," "asphalts," "flux," "tars" and "pitches," which definitions appear in their latest revised form in this new supplement.

# Foreign Abstracts and Patent Review

**Sintering Cement Clinker Brick.** W. N. Jung reports on the work of A. I. Korschunowa and co-workers S. M. Rojak and P. I. Galkin. Since many plants use cement clinker brick for lining the sintering zone, questionnaires were sent to cement plants in Russia, which inquired about the method of preparation of the clinker concrete lining and the operating conditions of the kilns, in order to clear up the factors which influence the life of the lining. Attempts to relate the life of the lining with the method of preparation produced no clear results, since the method of preparation of the bricks in the plants is rather diverse.

A certain dependence of the life of the brick on the construction of the kiln exists. In kilns with cylindrical sintering zone the life is shorter. In kilns with a widened sintering zone a longer life has been observed. The maximum life is given as 100 days and the average as 50 days. In the same plants, with the same capacities and methods of preparation of the brick, the life of the lining fluctuates within wide limits.

To investigate the structural changes in the cement clinker brick, samples were taken of the linings of a few rotary kilns at the time of shutdown for lining repair. Their conditions are described. In order to study the effect of an individual temperature on the cement clinker brick under conditions similar to those in the cement kiln a few were tested in a ceramic laboratory kiln. It showed that the brick, after the outside is destroyed by the heat in the sintering zone, is protected from total disintegration by the "burn skin," which, however, disintegrates as soon as the kiln is stopped and cooled, and drops off with adhering clinker when the kiln is again fired. These brick can therefore not be considered as fireproof.

Normal clinker and cement were then used to make the cement clinker brick into a homogeneously sintered mass to obtain a really fireproof, uniform brick. The best results were obtained with a mixture of 45 grams cement and 55 grams clinker sintered at 1450 deg. C. The difficulties encountered in maintaining a continuously constant temperature of 1450 deg. C. suggested a search for possible means to reduce the sintering temperature of cement clinker materials. Additions of fluorspar, calcium chloride and iron oxide were made, which made it easier to effect a complete sintering of the brick. If more than 5% additive was used auxiliary reactions were noticed which were not inherent in the portland cement clinker. Additions of chamotte, clay alumina, or kieselguhr were found unsuitable, as they resulted in easily fusible compounds which at higher temperatures led to complete disintegration of the samples.

Then sintered clinker brick were tested as to behavior in heating with consequent cooling on one side, brick with and without additives being tried. The samples developed cracks, then small gray spots on the edges of the cracks which grew, and finally resulted in disintegration of the brick, apparently due to the transfer of the $\beta$ $2CaO \cdot SiO_2$ form into the $\gamma$ form. In order to decrease this phenomenon, additions of boric and chromium salts in the form of $H_2BO_4$, $Cr_2O_3$ and $FeO \cdot Cr_2O_3$ were made. The greatest effect was obtained with a combination of 1% $CaCl_2$ and 2 to 3% $Cr_2O_3$. The brick thus prepared remained almost unchanged after 10 heatings with consequent coolings on one side. By substituting $Cr_2O_3$ for $K_2Cr_2O_7$ the samples remained unchanged after 14 repeated heatings and coolings.

The formation of large quantities of $\beta$ $2CaO \cdot SiO_2$ during sintering of the cement clinker brick is explained by the irregular distribution of $Ca(OH)_2$ in the mass of hardened cement. Pores which form in the brick probably are the spaces where the hydrate of lime gathers. It is therefore believed that calcium oxide is irregularly distributed in the hardened cement. A uniform distribution of calcium oxide in the mass to be sintered is, however, the most important prerequisite for a complete formation of the clinker materials.

In the masses which have less calcium oxide considerable quantities of bicalcium silicate are formed in repeated sintering. This explains the fact that the newly formed lime is unable to react completely, with the silicates and aluminates formed by the hydration of cement in repeated burning.

For these reasons lime as well as other compounds such as $Ca(OH)_2$, $Na_2SiO_3$, and bauxite were added in preparing the samples of cement clinker. The addition of 1 to 2% CaO exerts an effect similar to the addition of $Cr_2O_3$.

Investigations are to be made in a rotary kiln regarding the wear of clinker brick at 1500 deg. C. and other high temperatures.—*Zement* (1932) **21,** 30, pp. 433-438.

**Problems of Existence of Tricalcium Silicate.** A few years ago E. Jaenecke and R. Brill disputed the existence of tricalcium silicate on the basis of x-rayographic investigations. Dr. Bogue then gave them a preparation of $\beta$-dicalcium silicate and one of tricalcium silicate for x-rayographic examination. They then found that the alleged tricalcium silicate resulted in a diagram which conformed with their diagram of $\beta$-dicalcium-silicate. Bogue's dicalcium silicate, on the other hand, gave an x-rayogram unknown to them.

Analysis showed that in melting together the calculated quantities of lime and silicic acid a greater loss of silicic acid occurred by evaporation than expected. As a result the fusions prepared corresponding to the composition $2CaO \cdot SiO_2$ always contained $3CaO \cdot SiO_2$ also. Even though there was only a little $3CaO \cdot SiO_2$ in these preparations, the diagram obtained was nevertheless similar to that of tricalcium silicate to the point of confusing.

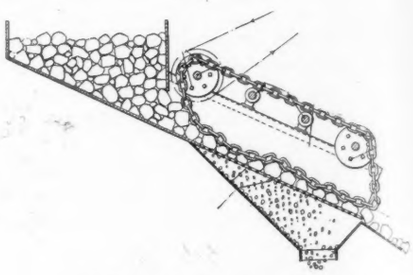
So it is agreed that the presence of a small quantity of tricalcium silicate can conceal the presence of the dicalcium silicate even if the diagrams of these two substances have an entirely different appearance. The authors now agree with other investigators and the existence of tricalcium silicate is no longer questioned.—*Zement* (1932) **21,** 26, pp. 380-381.

**Examination of Rotary Cement Kilns.** The series of articles on rotary cement kilns by Geoffrey Martin, which appeared in Rock Products in 1930 and 1931, is reviewed. These studies "are so noteworthy that a detailed review appears necessary for German readers in order that they can be compared more readily with other results, especially those of German investigators."—*Tonindustrie-Zeitung* (1932) **56,** nos. 52, 56.

## Recent Process Patents

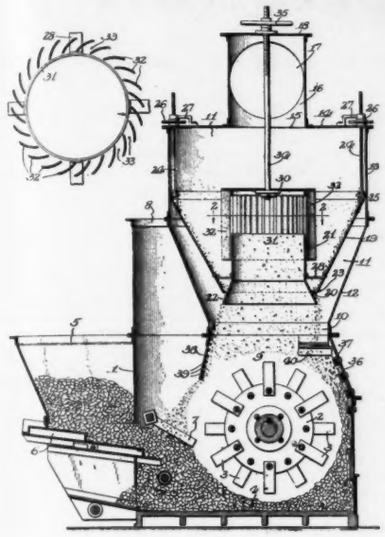
*The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.*

**Device for Controlling Materials.** The device consists of a number of endless chains running over rollers as shown in the illustration. One of the rollers is driven so that the chains will drag the material at any speed desired. The illustration shows the method applied to dragging stone over a screen. Other illustrations in the patent show it used to feed crushers and to load trucks and railroad cars. *W. Ross, U. S. Patent No.* 1,840,917.



***Endless chains control flow***

**Material Classifying Device.** The illustration shows a simple form of centrifugal air separator used above a hammer mill.



***Draft draws crushed product through mill***

The crushed product of the mill is drawn up through a cylinder by the draft of a fan. Surrounding and above this cylinder are a number of vanes set so as to give a circular motion to the air passing through them. This motion throws the coarse material to the sides of the cone while the fine material is carried away by the suction. The coarse material runs down the side of the cone and falls back into the mill. The special feature of this type of separator is the method of adjusting. The blades which give the rotating action are attached to a plate which can be moved up and down by a screw. The fineness and coarseness of the product may be varied by raising and lowering this plate and the blades, decreasing and increasing the area through which the air passes. *Henry G. Lykken, U. S. Patent No.* 1,835,886.

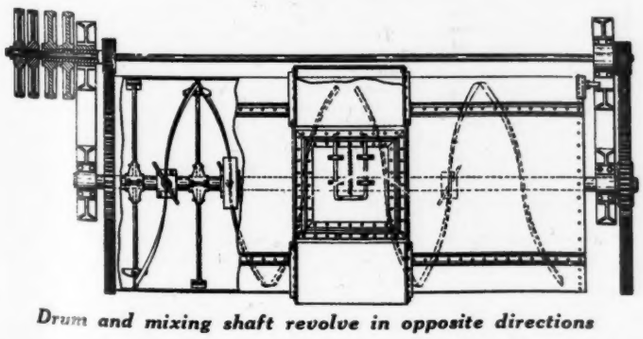
**Plaster Mixing Machine.** The device is a dry mixer especially adapted for mixing tinted plasters, although it may be used for other granular substances. It consists of a horizontal drum revolved by gears. Running through it is a shaft carrying mixing members that can be revolved in the opposite direction. One set of these tends to throw the material to the center of the drum, the other to throw it away from the center. The drum is filled and emptied through a trap door.

In operation the drum is charged with the ingredients and run five or ten minutes. Then the drum is reversed and run in the opposite direction until a pawl engages a ratchet and holds the drum with the trap door upmost. The door is removed and the drum rotated until the drum empties. When it is clear the drum is stopped with the pawl. *Henry Stinson Johns, assignor to Bancroft Holdings, Ltd., Hamilton, Ont., Canada., U. S. Patent No.* 1,816,588.

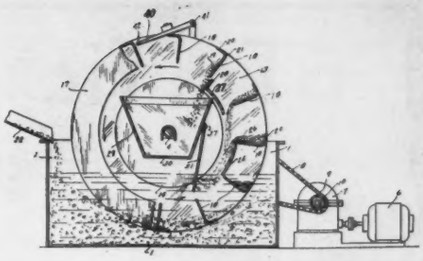
**Dust Preventive for Roads.** A dust preventative is made of a mineral of the vermiculite family, preferably zonolite. It is mixed with calcium chloride, either granular or flaky, a preferred proportion being 7 lb. of zonolite with 3 to 5 lb. of calcium chloride. This is spread about ¾ in. thick and rolled to ¼ to ⅛ in. The blanket so formed has a high insulating value, to keep the sun's heat from drying the road. And the calcium chloride conserves the moisture. *James Keeth, U. S. Patent No.* 1,836,255.

**Process for Making High Early Strength Cement.** The inventor claims that cement made by this process will be waterproofed and have high early strength qualities. It resembles "Super cement," made by the use of tannic acid and gypsum, in some respects, but there are some differences in details of manufacture. Moisture must be kept low and the loss by ignition must not exceed 0.6%. And the fineness should be such that 95% will pass a 200-mesh sieve. The high early strength is believed due to the stimulating effect of the tannin to the hydration of the dicalcium silicate in the clinker. *Joseph F. Goddard, England, Assignor to Super Cement Co., Detroit, Mich., U. S. Patent No.* 1,840,710.

**Process for the Manufacture of Cement.** Granulated slag which does not contain more than 3% of moisture, or tufa, trass or some other similar material, is ground with burned unslaked lime to the fineness of cement, gypsum being added, preferably in its unburned condition. The inventor prefers to grind all three materials together. The finished cement should run from 50 to 56% in alumina. An example given contains 2 to 5 parts of gypsum, 6 to 20 parts of unslaked lime, and 95 to 79 parts of dried water-granulated slag from copper smelting. This cement is said to have unusually good storing qualities. *Oscar Nickel and Reinhold Markwitz, Germany, U. S. Patent No.* 1,834,-799.



***Drum and mixing shaft revolve in opposite directions***



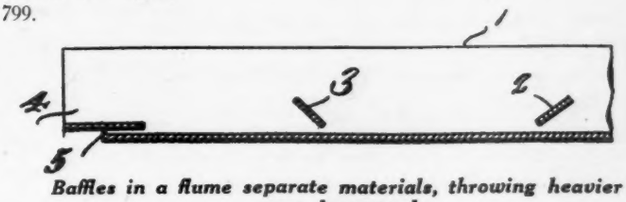
***Device raps buckets as they pass***

**Classifier for Sand and Gravel Plants.** This invention is like a sand wheel which is in fairly common use, except for two features which are shown in the accompanying illustration. One is the shield (27). This is placed so that the coarse material will not fall into the trough until the fine material on top has fallen back into the tank. The other is the lever and weight (40). This is arranged so that the lever is raised by one bucket and falls back to strike the next bucket. This jars loose any material sticking to the bucket. *Otis E. Perkins, U. S. Patent No.* 1,839,804.

**Plaster Board Manufacture.** The method described consists of placing the plaster mixture on a cover sheet, embedding a reinforcing strip in the plaster, putting on the top covering sheet and compressing the mixture between the covering sheets. The reinforcing is fed to the board making machine by a device that either cuts and bends the reinforcing to make short pieces or it feeds it in as a continuous strip.—*Theodore E. Knowlton, assignor to Certain-teed Products Corp., U. S. Patent No.* 1,798,609.

**Coal Dust Remover.** Coal is fed to a broad belt loose enough to hang with a sag. The belt is inclined to the side so that the coal will work off that way. The belt is of soft material and has corrugations running crosswise. These catch and hold the coal dust, which is shaken off into a receptacle below.—*Vivian St. Laurence Symonds, Canada, U. S. Patent No.* 1,834,658.

**Separation Method.** This very simple method of separating two solids of different specific gravities employs baffles in a flume or trough. The first (2) checks the flow of the liquid, the second (3) offers less resistance but tends to throw the heavier part down. By a succession of bafflings the lighter material is caused to rise to the top. This flows out over a horizontal partition while the heavier material flows out through an opening below.—*Bianca Adams Miller, U. S. Patent No.* 1,818,640.




***Baffles in a flume separate materials, throwing heavier ones downward***

# Traffic and Transportation

## Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week ending October 1:

### NEW ENGLAND FREIGHT ASSOCIATION DOCKET

26596. **Amiesite or stone,** crushed (See Note 3), from Winchester to Worcester, Mass. Present—$1 net ton. Proposed—94c. (See Note 4.)

26757. **Stone, broken or crushed,** in bulk in gondola cars or other open top cars (See Note 2), from West Quincy, Mass., to Pawtucket and Providence, R. I. Present rate, 85c; proposed, $1 per net ton. Reason—To cancel obsolete commodity rate.

26807. **Limestone, agricultural, broken or unburnt, ground,** minimum weight 50,000 lb., from Falls Village, Conn., to B. & Ar. R. R. stations named in Item 135-B of N. H. R. R., I. C. C. F-3105. Proposed, same rates as currently effective from Ashley Falls and Lee, Mass. (Representative rates shown below): To Caribou and Presque Isle, Me., present 46c, proposed 32½c; Limestone and Van Buren, Me., present 48c, proposed 33½c.

### TRUNK LINE ASSOCIATION DOCKET

29841. **Sand and gravel,** carloads (See Note 2), from Cape May, N. J., to St. Jerome, Que., 30¾c per 100 lb. Present rate, 44c per 100 lb., sixth class. Reason—Proposed rate is a combination of commodity rates.

29845. **Slag** (See Note 2), from Johnstown, Penn., to Gray, Penn., 80c per net ton, plus emergency charge. (Present rate, 12c per 100 lb., sixth class rate as per Agent Curlett's I. C. C. No. A-336, plus emergency charge). Proposed rate to expire six months after effective date, unless sooner canceled, changed or extended, and present rate to continue thereafter. (See Note 4.)

29846. **Sand,** other than blast, engine, foundry, glass, molding, quartz, silex or silica, carloads (See Note 2), from Philadelphia, Penn., to Hamburg, Penn., $1.10 per net ton. Present rate, $1.15. (See Note 4.)

29850. **Crushed stone,** carloads (See Note 2), to New Boston Jct., Penn., from Temple, Penn., 85c, and Birdsboro, Penn., 90c per net ton. (See Note 4.)

29851. **Limestone, ground,** carloads, minimum weight 50,000 lb., from Annville, Penn., to Indiana, Penn., Dayton and Hightstown, N. J., 13c per 100 lb. (See Note 4.)

29872. **Crushed stone,** carloads (See Note 2), to M. & P. R. R. stations, Baltimore, Baldwin, Forest Hill, Md., Woodbine, Red Lion, Ore Valley, Penn., and various. From Billmyer, Penn., rates ranging from 95c to $1.45 per net ton; from Union Stone Co., rates ranging from 90c to $1.45 per net ton, and from Bainbridge, Penn., rates ranging from 95c to $1.45 per net ton. (See Note 4.)

29873. **Sand,** other than blast, engine, fire, foundry, glass, molding, quartz, silex or silica, carloads (See Note 2), from Morrisville, Penn., to Coatesville, Penn., 90c per net ton. (Present rate, $1.05.) (See Note 4.)

29875. **Sand,** carloads (See Note 2), from Masonville to South Pemberton, N. J., to Fish House, N. J., 69c per net ton. (Present rate, 75c.) Reason—Proposed rate is comparable with rate to Camden, N. J.

29878. **Limestone, ground or pulverized,** carloads, minimum weight 50,000 lb., from Munns, N. Y., to D. L. & W. R. R. stations—Clarks Summit, New Milford, Binghamton, Owego, Ithaca, Elmira, Solon, Syracuse, Haynes, Bridgewater, Washington Mills and various. Rates ranging from $1.10 to $1.70 per net ton. Reason—Proposed rates are fairly comparable with rates from Jamesville, N. Y.

29850. **Crushed stone,** carloads (See Note 2), from Monocacy, Penn., to New Boston Jct., Penn., 90c per net ton.

29882. **Ground limestone,** carloads, minimum weight 50,000 lb., from Howes Cave, N. Y., to B. & A. R. R. stations, Boston, Mass., to Springfield, Mass., inclusive, 16c; Indian Orchard, Mass., to Delton, Mass., inclusive, 15c; and Pittsfield, Mass., to Richmond Furnace, Mass., inclusive, 13c per 100 lb. (See Note 4.)

29886. **Sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand), carloads, **gravel,** carloads (See Note 2), from Boonville, N. Y., to Martinsburg, N. Y., 60c per net ton. (Present rate, 75c.) (See Note 4.)

### CENTRAL FREIGHT ASSOCIATION DOCKET

33003. To establish on **sand, blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica,** carloads, from Phalanx, O., to Flint, Mich., rate of 220c per net ton. Present, 265c.

33023. To establish on **stone, crushed** (in bulk, in open top cars), carloads, from Genoa, Martin, Marblehead and Sandusky, O., to points in Ohio, rates as shown in Exhibit A attached.

EXHIBIT A

| To | From Genoa and Martin, O. Prop. | Pres. | From Marblehead, O. Prop. | Pres. |
|---|---|---|---|---|
| N.Y.C. R.R. stas. | | | | |
| Minerva | 135 | 140 | ..... | ..... |
| Watheys | 135 | 150 | 125 | 140 |
| Dillonvale | 145 | (1) | 135 | 140 |
| W.&L.E. Ry. stas. | | | | |
| Scio | 135 | (1) | 125 | 130 |
| Unionvale | 145 | (1) | ..... | ..... |
| Neffs | 155 | (1) | 145 | 150 |
| Dillonvale | 145 | (1) | 135 | 140 |
| Tiltonville | 145 | (1) | 145 | 150 |
| Martins Ferry | 155 | (1) | 145 | (1) |
| Steubenville | 155 | (1) | 145 | 150 |

| To W. & L. E. Ry. stations | From Sandusky, O. Prop. | Pres. |
|---|---|---|
| Scio, O. | 125 | 130 |
| Unionvale, O. | 125 | 130 |
| Neffs, O. | 135 | 150 |
| Dillonvale, O. | 135 | 140 |
| Tiltonville, O. | 135 | 150 |
| Martins Ferry, O. | 135 | (1) |
| Steubenville, O. | 145 | 150 |

(1) Sixth class.

**Note 1—Minimum weight marked capacity of car.**

**Note 2—Minimum weight 90% of marked capacity of car.**

**Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.**

**Note 4—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.**

33042. To establish on **stone, crushed, limestone, crushed or crude,** and **limestone screenings** (in bulk, in open top cars), from Alsace, Penn., to Sugar Creek, Utica, Carleton, Cochranton, 100c; Meadville, Penn., 110c per net ton. Present rate, 300c.

33080. To establish on **stone, dolomite, raw or crude; stone, fluxing,** in straight or mixed carloads, from Gibsonburg, Woodville and Maple Grove, O., to Utica, O., rate of $1.13 per gross ton. Present rate, $3.40 per net ton.

33083. To establish on **stone, crushed,** carloads (See Note 3), from Sandusky, O., to Mansfield, O., rate of 50c per net ton, plus emergency charge. Present rate, 70c, per B. & O. R. R. Tariff H3336-D.

### CENTRAL FREIGHT ASSOCIATION DOCKET

33152. To establish on **sand, gravel and stone, crushed, coated with oil, tar, pitch or asphaltum,** carloads, from Indianapolis, Ind., to Muncie, Ind., rate of 130c per net ton. (Emergency increase in addition.) Present, 150c per net ton (emergency increase in addition) per C. C. C. & St. L. Ry. Tariff No. 1770X, to Winchester, Ind., applicable to Muncie, account intermediate to Winchester, Ind.

33154. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel,** carloads, from Hugo, O., to North Randall and Solon, O., rate of 70c per net ton. Present rate, 80c per net ton (intermediate to Mantua, O., via N. Y. C. R. R., Cleveland, O., and Erie R. R.), per N. Y. C. Tariff I. C. C. L S. 1413.

33159. To establish on **limestone, raw dolomite,** in box cars, carloads (See Note 3), from Carey, O., to Knox and Marienville, 220c, and to Parkers Landing, Penn., 200c per net ton, emergency charge in addition. Present, 250c to Knox and Marienville and 320c per net ton to Parkers Landing, Penn., emergency charge in addition. Present rates to Knox and Marienville are on Rochester basis, rates to Rochester, N. Y., being published in Sup. 20 to Agent Jones' 218H, Item 9846. Present rate to Parkers Landing is sixth class basis under application of B. & O. eastbound billing book.

33163. To establish on **sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) or **gravel, crushed stone,** and **furnace slag,** carloads, from Buffalo, N. Y. (rates in cents per net ton):

| To (Penn.) | Present rates—Slag | Crushed stone | Sand and gravel | Prop. rates |
|---|---|---|---|---|
| Mill Village | *150 | 140 | 125 | ‡110 |
| Millers | *150 | 140 | 140 | ‡110 |
| Cambridge Springs | *150 | 140 | 140 | ‡110 |
| Venango | 185 | 160 | 160 | 120 |
| Saegertown | 185 | 160 | 160 | 120 |

*Effective October 1 will be $1.10.

‡Proposed rate of $1.10 only involves reduction in rates on crushed stone, sand and gravel.

33206. To establish on **crushed stone, agricultural limestone and agricultural limestone screenings,** in open top cars, carloads, from McVittys, O., to Minerva, O., rate of 120c per net ton, emergency charge in addition. Present, 18c (sixth class), emergency charge in addition.

### SOUTHWESTERN FREIGHT BUREAU DOCKET

25615. **Silica sand,** from Illinois points to points in Arkansas, Louisiana, Oklahoma and Texas. To establish specific rates on silica sand, carloads, in box cars; also in open top cars (See Note 3), from Ottawa, Utica, Wedron, Millington, Sheridan and Oregon, Ill., to points in Arkansas, Louisiana (west of the Mississippi river), Oklahoma and Texas, using as a basis the scales prescribed by the Interstate Commerce Commission in I. C. C. 17000-11-A, and as published in Item 200 of S. W. L. Tariff 162E, W. T. L. Tariff 238A, the scales to be extended beyond 1000 mi. on shipments in box cars and beyond 800 mi. on shipments in open top cars to cover maximum mileage involved; the gradation in the scale rates beyond such distances to be at the rate of 10c per net ton for each additional 50 mi. Origins to be grouped at one rate; destination territory to be grouped; average distances between groups to determine rate; distances to be figured in the same manner as prescribed in I. C. C. 17000-11-A. Illinois shippers point out that the scales prescribed by the commission in I. C. C. 17000, Part 11-A, are applicable from points in Missouri to stations in Oklahoma and Arkansas and from Arkansas to Oklahoma, Texas and Louisiana. They feel that they should be placed upon a basis comparable to that in effect from Missouri and Arkansas producing points in order that they may have a fair opportunity for competing for business in the southwest.

25641. **Sand and gravel,** from Missouri points to St. Louis, Mo., East St. Louis, Ill., and Granite City, Ill. To establish the following rates in cents per ton of 2000 lb. on sand and gravel as per descriptions A and B, from Crystal City and Festus, Mo., and intermediate Missouri points named, to St. Louis, Mo., East St. Louis, Ill., and Granite City, Ill., as shown below. Description:

A—Silica (white sand) as described in Item 2430C, Sup. 36, S. W. L. Tariff No. 68M.

B—Sand (river) and gravel as described in Item 2445B, Sup. 36, S. W. L. Tariff No. 68M.

Rates in cents per 2000 lb.

| To | Description A | B |
|---|---|---|
| St. Louis, Mo. | *70 | ..... |
| East St. Louis, Ill. | †82 | †77, 77(‡) |
| Granite City, Ill. | †82 | †77 |

*No switching will be absorbed at destination.

†Rates to East St. Louis, Ill., and points within the East St. Louis, Ill., switching district apply for T. R. R. A. of St. Louis or A. & S. R. R. delivery only. S. W. L. Tariff 68-M. M.-I. Tariff 885-C. W. T. L. Tariff 237-A.

‡See Note.

Note: Applies on sand (river) and gravel as described in Item 2450-C, Sup. 36, S. W. L. Tariff 68-M, from Le May, Mo., to Barnhart, Mo. (Index Nos. 1705 to 1730, inclusive, of S. W. L. 68-M). This change necessary to clear fourth section.

The above is to meet the rate of the M.-I. R. R. from and to the same points.

A-862. **Agricultural limestone,** L.C.L., from, to and between points in the Southwest and Kansas-Missouri territory. To establish Column 27½ (or Class 27½) basis of rates on agricultural limestone, less carload, from, to and between all points covered by S. W. L. Tariffs 151, 152-B, 153 and 154-B and related tariffs, including S. W. L. Tariffs 104-C and 159-A. W. T. L. Rate Advice No. 15553, Docket 7945, authorizes 1½ times Class E in Item 1290, W. T. L. Tariff 207-C, for application in W. T. L. territory. Shipper at Carthage requests same basis and states it will develop greater movement because farmers cannot now use full carloads and cannot afford to pay fourth class rates, less carload; also that the proposed basis will enable movement of many samples for experiment, which should later develop a greater carload movement.

### WESTERN TRUNK LINE DOCKET

496-T. Rates—**Limestone, agricultural, ground or pulverized,** in bags, barrels or in bulk, for soil treatment, carloads (See Note 2), from Weeping Water, Neb., to C. B. & Q. R. R. stations in northwest Missouri and Wabash Ry. stations in Missouri as far south as Conception, Mo. Rates—Present, same as applicable on sand, gravel or stone, which figures approximately ½c to 3½c per 100 lb. higher than proposed rates. Proposed rates in cents per ton of 2,000 lb.:

| Mi. | Prop. | Mi. | Prop. | Mi. | Prop. |
|---|---|---|---|---|---|
| 40 | 59 | 120 | 102 | 190 | 131 |
| 50 | 63 | 130 | 107 | 200 | 135 |
| 60 | 67 | 140 | 111 | 210 | 138 |
| 70 | 71 | 145 | 113 | 220 | 141 |
| 80 | 76 | 150 | 115 | 225 | 144 |
| 90 | 82 | 160 | 119 | 230 | 144 |
| 100 | 88 | 170 | 123 | 240 | 147 |
| 110 | 96 | 175 | 125 | 250 | 150 |
| 115 | 99 | 180 | 127 | | |

4920-1. **Sand, gravel and chatt coated with oil, tar, asphalt or asphaltum,** carloads, between stations in Western Trunk Line territory. Please refer to Docket Bulletin No. 3289, dated September 17, 1932. Docket No. 4920-1. The above proposal now covered by Docket 4920-1 has been converted into Emergency Proposal No. 51-25.

8127. **Sand and gravel,** carloads, classified Class E in Western Classification, minimum weight 40,000 lb., from W. T. L. territory to eastern points named in C. F. A. Tariffs 491 and 492-A. Rates: Present, sixth class in Official Classification; proposed, Class E in Western Classification.

### ILLINOIS FREIGHT ASSOCIATION DOCKET

5963. **Sand and gravel,** etc., carloads, as described in Item 260 of Agent F. L. Speiden's Tariff 388-A, I. C. C. 1635, from Elco, Ill. (rates in cents per net ton):

| To | Pres. | Prop. |
|---|---|---|
| Cayce, Ky. | 90 | 80 |
| Trenton, Tenn. | 110 | 100 |
| Gilmore, Tenn. | 120 | 110 |
| Ramer, Tenn. | 135 | 130 |

5963. **Sand and gravel,** etc., carloads, as described in Item 260 of Agent F. L. Speiden's Tariff 388A, I. C. C. 1635, from Elco, Ill. Rates per net ton.

| To | Pres. | Prop. |
|---|---|---|
| Cayce, Ky. | $0.90 | $0.80 |
| Trenton, Tenn. | 1.10 | 1.00 |
| Gilmore, Tenn. | 1.20 | 1.10 |
| Ramer, Tenn. | 1.35 | 1.30 |

3339. **Gravel and/or sand,** carloads, coated or treated with asphaltum, oil or tar, from Aurora, Ill., to stations in Illinois. Present—No specific rates. Proposed (in cents per net ton)—25 mi. or under, 96; 40, 107; 60, 119; 75, 130; 100, 142; 125, 153; 150, 176.

5301-A. **Silica sand,** carloads, usual minimum weight, from Brownstown, Wis., to East St. Louis, Ill., and St. Louis, Mo. Rates per net ton. Present, $2.40; proposed, $2.11 processed, $1.99 crude.

6855. **Stone, crushed, limestone, agricultural** (ground or pulverized for soil treatment); **limestone** (ground); also strippings of stone quarries and stripping, sand or gravel pit; chatts (lead or zinc mine refuse); rubble stone (rough, broken, irregular pieces, not machined or tooled); rip rap, minimum weight marked capacity of car, from Cairo, Ill., to Kinmundy, Ill. Present, $1.26 per net ton; proposed, class or combination rates.

## Proposed I. C. C. Decisions

**24916. Sand.** With Commissioner Mahaffie writing a dissent almost twice as long as the report of the majority, the Interstate Commerce Commission, by division 5, in No. 24916, Koss Construction Co. vs. C. B. & Q., has found unreasonable a rate of $1.35 a net ton on sand shipped from Des Moines, Ia., to Andover and Blytheville, Mo., 102 and 110 miles from Des Moines, respectively. The rate, which, according to the report, was still in effect, was found unreasonable to the extent it exceeded $1.20 a net ton. Reparation was awarded. The condemned rate was collected on 127 carloads.

The complainant asked for reparation only. The finding of the commission relates only to the past, no reference to the future rate being made.

## I. C. C. Decisions

**24736. Crushed Stone.** York Valley Lime and Stone Co., Inc., vs. Pennsylvania. Dismissed. Rates, crushed stone, Campbell, Penn., to destinations in Maryland are held not unreasonable.

**24507. Phosphate Rock.** Jackson Fertilizer Co. vs. A. C. L. et al., embracing also No. 24831, Jackson Fertilizer Co. vs. A. C. L. et al. Complaints dismissed. Rate, crude phosphate rock, Bartow and nearby points in Florida to Jackson, Miss., are held not unreasonable or unduly prejudicial.

## Approve Reduced Sand Rates in Minnesota

THE Milwaukee and the Great Western railroads were granted authority September 14 to decrease rates charged on sand, gravel and crushed stone from the Twin Cities to southern Minnesota points, effective September 15.

Under the order, the two roads may charge up to 4c. a hundred pounds, a decrease of approximately 2c. between several of the points involved.

The rates would be effective from the Twin Cities, St. Louis Park, Lakeland, Winona, Preston, Mankato and Faribault to Albert Lea, Hayward, Oakland, Ramsey, Austin, Browndale, Dexter, Grand Meadow, Spring Valley and Elkton.

Following the filing of the order, Foley Bros. of St. Paul filed an appeal with the commission from the rate order.—*St. Paul* (Minn.) *Dispatch.*

## Rules Sand and Gravel Rates Not Unreasonable

SAND and gravel rates charged by the Norfolk and Western and Pennsylvania railroad between Newtown, Lebanon and the Cincinnati switching district are not unreasonable, the Ohio State Utilities Commission held in dismissing the petition of the Van Camp Sand and Gravel Co. of Cincinnati for reduced rates. The gravel company charged the 40c. per ton rate charged by the Pennsylvania between Lebanon and Cincinnati and the $10 rate charged by the Norfolk and Western from the Newtown district to the Queen City unjust and unreasonable.—*Cincinnati* (Ohio) *Enquirer.*

## Appeals to Supreme Court in Gravel Rate Case

THE Moline Consumers Co., Moline, Ill., has carried to the state supreme court a fight against freight rates charged by the Chicago, Burlington and Quincy, the Chicago and Illinois Valley, and the Illinois Traction railways on shipments of sand and gravel to Ottawa and other points in the Ottawa switching district.

The company had protested the rates to the Illinois Commerce Commission, its appeal set out, but was denied relief. The case was then appealed to the circuit court of La Salle county, which upheld the commerce commission.—*Davenport* (Iowa) *Times.*

## State Can Not Lease Lake Frontage of Private Property

IN ORDERING a new trial relative to a lease by the conservation department for sand and gravel rights in front of private property, the Michigan state supreme court holds the department is without authority to make any leases other than to a shore line owner, or if state-owned, to the person or firm bidding for the business.

The Soo Sand and Gravel Co. brought suit in Chippewa county against the Sullivan Dredging Co. and Whitney Bros. for sand and gravel taken in front of its property bordering Lake Superior.

The defendants had a lease from the conservation department, but the plaintiffs owned the frontage. The trial court held the lease valid, which was reversed and a new trial ordered.

The department, the court held, may lease in front of state-owned lands and to the owner of the frontage.—*Saginaw* (Mich.) *News.*

## Sells Railroad Serving Stone Producing District

THE Colorado-Kansas railroad, operating between Pueblo and Stone City, Colo., its principal business the conveying of stone from quarries along the line, was sold October 1 at a trustee's sale under a mortgage to L. D. Riker of Oklahoma City. This sale is subject to the court's approval. Mr. Riker states he will continue its operation.

## Investigates Missouri Deposit of Rock Asphalt

D. V. SNOWGOOSE, a representative of the Mo-Roc-A Asphalt Co. of Kansas City, Mo., recently examined a 10-ft. vein of asphalt rock near Hume, Mo. Practically all the desired land is now under lease and an analysis of the material will be made, followed by drilling to locate the veins.

If these investigations prove satisfactory it is said that the company plans to build a mill south of Hume, where rock will be crushed and loaded for shipping to the Kanas City plant for processing.

It is said that the asphalt rock in the Hume field runs from 10 to 12 ft. in thickness and is only about 20 ft. below the surface. In case it is mined, the owner of the land will get a royalty of 10%.

# High Lights of the Safety Congress

## With the Address of E. J. Mehren, President of the Portland Cement Association, in Full

AT THE ANNUAL National Safety Congress, held this year, October 3-7, at Washington, D. C., there were numerous papers and discussions of interest to rock products producers. One of the best addresses was that of Edward J. Mehren, president of the Portland Cement Association. This is given in full in what follows. Some other of the high spots are given in brief abstracts, others will follow in the October 22 issue, including a digest of the symposium on dust hazards in the rock products industry.

### *Good-Will Dividends From Safety Work*

**Edward J. Mehren,** president, Portland Cement Association, Chicago, Ill., addressed the Safety Congress as follows:

"Probably many of you have wondered, in reading the title of my address, why I have turned to what seems a minor field in inquiry and have neglected the major and more obvious benefits of safety work. True, I have chosen to speak of a byproduct rather than a direct effect. I have passed over the great areas of immediate benefit—the physical, the social and the financial results of safety work.

"But why should I not neglect them? You, the experts, have traversed these fields thoroughly. You have set figures on their value. For me, therefore, a less explored area is advisable.

"But, further, I do not regard the field of my survey as a minor one. It is indirect, it is true. Its benefits are difficult to weigh and scale. But its influence is mighty; I might even say, all-pervasive. For the good-will that flows from industrial safety work can help our industries in their task of making sound adjustments internally and in their relations with the public. Approximately 33% of us Americans and our families live our lives in and through industries. As individuals, as a nation, we are affected by their operations and by their relations to the public. Any force that can favorably influence their internal and external adjustments is obviously important in American life.

"Such a force I conceive to be the good-will that flows from safety work.

### *Good-Will in the Plant*

"This good-will obviously shows itself first in the industrial plant itself. There is found the first of the good-will dividends. To understand how they are earned one must know the mechanism of safety work. You who are industrialists know how it operates. It is not only inspection and safeguarding of dangerous machines. It is not only fire drills and first-aid work. It is not only safety teams and exhibitions. It is all of these and more. Above all, it is an education of men in hazards and their reduction, in the value of health and sound limb to workers and their families, in mutual responsibility for each other's safety.

"Its mechanism is the safety committee wherein foremen and other workers report and discuss hazards, study accidents, decide on preventives, and—most remarkably—impose on themselves the responsibility to see

*Edward J. Mehren*

that these preventives work. The safety committee, then, is

—a body of technical experts on accident prevention
—a keen-eyed vigilance committee to spot hazards
—an analyst to diagnose causes
—a deliberative body to resolve on a program
—a moral force to secure acceptance and observance of its decisions
—a group actuated by the high motive of conserving for their families their own lives and limbs and the lives and limbs of their fellow workers
—a committee, acting by themselves, but on problems of deep concern to the management and therefore in constant counsel with the management group

"In rotation men take membership on the safety committee. It is a school wherein men are discovered, educated, inspired; given a comprehensive view of the industry, its purposes, its ideals, its management. They are no longer "mill-hands" or numbers on a payroll, but men, expected to think, and respected because they do so.

"What more natural than that these committees—deliberative and legislative bodies as they are—should have taken on wider functions? Without urging, they have applied themselves to personnel problems and placement, discipline, relief, community service, education and recreation. By natural stages they have become an informal works council, without commission other than the commission of knowledge, without authority other than that of the workers' and the management's confidence.

"Having said this much, need I point out the good-will dividend that has ensued? Where men are regarded as men they give of the loyalty of men. In such plants there is understanding between workers and management. The safety committee has become a means for exchanging views. In the cement industry, for example, our excellent employe relationships are due to the removal of all ground for discord and dissatisfaction through the operations of the safety committees.

"Good-will is evidenced in plant loyalty and devoted workmanship, which seek always the success of the enterprise. The plant has become not '*the* company' but '*our* company.'

"Thus do we receive the good-will dividend in the plant itself. Thus do we promote the internal adjustment of which I spoke in my opening remarks.

### *Good-Will of the Community*

"The satisfaction, the pride, the loyalty thus developed cannot be confined to plant limits. The men take them home. '*The* company' has become '*our* company' to wives and children as well. Why not? Has it not operated mightily for wife and children in safeguarding the worker's life and limb?

"Further, safety lessons learned in the factory are carried to the home, the schoolroom, the lunch club and the public-safety group. Mishaps are reduced in the home and on the street. The worker, in learning to protect himself, has learned to safeguard the lives of his family and neighbors.

"As accidents have dwindled pauperism and demands on charity have declined. Buying power has increased and so have saving deposits. Homes are better kept. Families rise to a higher scale of living. Community life benefits. The social dividend is high.

"The story travels. The plant acquires a good reputation. It has the pick of the workers. Smoke from its chimney that

might have worried the town now issues forth as a good omen. While it continues jobs are secure.

"Local officials take pride in the enterprise. Neighbor industrialists accord it leadership. Public regard develops a feeling akin to ownership. The final result is that officials and the public help where they might hinder. Here we have a step, through the agency of safety, in the adjustment of industry in its relations with the public. And this is another good-will dividend from safety work.

### *Good-Will of the General Public*

"The spread of good-will beyond the community is of a less tangible and demonstrable order. But it is real nevertheless. Here I must call specifically on the experience of the cement industry.

"We have made, as you know, an enviable safety record. The story has reached the public in many ways, one of them through the wide publicity given to the dedication of safety trophies at plants which have gone through the year without a lost-time accident. The trophies are handsome massive monuments—made of concrete, of course—which are unveiled at dignified and inspiring ceremonies, often the biggest events in the histories of their communities. Governors, U. S. senators, congressmen, mayors, other officials are glad to grace these occasions because they are evidence of a valuable, unselfish social service to the community. They have been loud in their praise of our accomplishment and that praise has echoed even beyond the boundaries of the appropriate state.

"Our annual June no-accident campaign, in which every operating man in our industry is enrolled, is made the subject of tremendous interest in every cement mill and quarry community. Many other industries seek to enroll. Over a hundred mass meetings of our workers are held simultaneously each year on the last day of May and 160 flag-raising ceremonies occur on the following morning. They are the opening guns in a campaign, but the battle is for safety, not for slaughter. These events frequently touch off community safety drives as well. Obviously, the cement company and the cement industry come to favorable notice.

### *Good-Will of Compensation Commissioners*

"Over the country, our key operating men, in the proportion of about one for every twenty men employed, assemble annually at convenient points for regional safety conferences. Interchange of ideas, analysis of trends and suggestions, renewal of enthusiasm are the objectives. These affairs have become events of outstanding interest. They have attracted cabinet members, governors, leading educators and sociologists. The papers and deliberations have found their way into the public and the trade press and have been reprinted by the thousands.

"Among the most valued evidences of good-will from our safety work are the unsolicited messages of congratulation and encouragement received from state officials charged with the reduction of industrial accidents. Some of you commissioners here today have furnished the word of impetus and cheer that has sent us full steam ahead into our best efforts.

"One commissioner recently wrote: 'My own slant on the depression is that if industry ever needed the example of inspiring safety records, it needs it now. Reduction of accident waste can be a most important factor in rehabilitation, as you realize, and my concern comes from the tendency to scrap safety effort now as a misguided step toward economy. For these reasons I feel that the Portland Cement Association is to be more than ever congratulated on what it has done for the cause of safety in June, 1932.'

"Another says: 'The safety record of the cement industry should be an incentive for others to go and do likewise, and I trust that the State Safety Codes Commission (which, by the way, will meet for organization today) may be able to use your good work as an example for others to profit thereby, to the happiness, health and wealth of mankind.'

"Still another: 'Let me congratulate you upon your excellent record, and if you will refer to *Safety Engineering* for July you will note that I have said so publicly.'

"You of the National Safety Council have given to the press much about our record and this distribution has spread a good name for us far and near. Mr. Cameron's recent press statement on our work is highly valued by every cement man.

"By many other means and channels this word of our accomplishment for the welfare of our men has spread and built good-will.

### *Value of This Good-Will*

"We cannot measure accurately the value of the favorable attitude thus created. We know that any industry is liable to attack and criticism by the designing and uninformed. But such attack is parried, in part at least, if there is a shield of public goodwill.

"I believe, too, that public favor builds business. If any are inclined to doubt me, I ask them whether the 'House of Magic,' whether Gerard Swope's leadership in social thinking, whether Owen D. Young's eminence in social thought and international economics have made business for General Electric? I believe they have, for they have predisposed people toward that great company. To their minds, the 'House of Magic,' Swope and Young give assurance that the General Electric is progressive, reliable, square-shooting.

"In similar fashion, good-will is a business builder for any organization which possesses it.

"Again, we have a good-will dividend from safety work, again a step in improving the relations between industry and the public.

### *International Good-Will*

"Perhaps we can extend our survey further and discover in America's safety effort international benefits. Certainly the world accords us the leadership in safety. We are elevated as the shining example of what can be done. Possibly our regard for men, as evidenced by this work, may be a softener of the criticism that foreigners so often pass on us as money-getters. In this work, surely, humanitarian considerations have prevailed.

### *Good-Will Only a Byproduct*

"I come now, in closing, to two points that are essential if there are to be good-will dividends from safety effort.

"*The first is this, that good-will must never be the designed purpose of safety work. It must of its nature be a byproduct.*

"For if good-will be made the purpose, the work is immediately deflected from its only sound objective—the conservation of life and limb. Being deflected from its objective, it ceases to conserve life and limb, and must necessarily fail as a good-will builder as well.

"The second flows from the first—and is inherent therein. *Safety work that will yield byproducts must be sincere; it must, in full faith and honesty, be directed to the conservation of men.* There can be no camouflage. Then only will men respond. No one is keener than they to detect insincerity. If they sense that they are regarded as robots, expensive to maim, to injure, to kill, they will not put mind and heart into safety work. There may be some accident reduction. Even in that area the work will fall short of its possibilities. But there can be no good-will dividends, because the confidence and the interest of the worker is lacking.

"If you should ask me why the cement industry has for some years held the leading position in low frequency of accidents and has twice received the very high honor of the Joseph A. Holmes award, I must answer that it lies in the sincerity of the industry's interests in its men. First, last, always, we have aimed to protect them. We have saved men, even though insurance premiums were not reduced.

"In the process of saving them we have given them responsibility, we have raised their estimate of themselves. It has been a joy to see them respond and grow.

"But if the men have grown, so, too, have the managers. If the worker sees somewhat through our eyes, we now see partly through his. We are more alert to his interest, as he is to ours. We are broader, more considerate, better managers.

### *Conclusion*

"In conclusion let me say that I shudder to think of what would have happened had safety work not developed. As a young man I had occasion to spend time in northern Michigan. I was struck by the human

wreckage of the mines and lumber camps. Crutches were in common evidence. That which death concealed was a heavier toll than the crutches revealed.

"As the years have flown, mechanisms have become more gigantic, swifter, more complex, their crushing power greater. Had there been no safety work, the toll would now cry to high heaven. But safety work, motivated by interest in the man, has snatched the prey from the destroyer. Other benefits have ensued. Weigh them, as you will, with all your expert knowledge. Cast up your accounts in terms of life and limb conserved, of family and community benefits, of savings in cost. Offer them all as the contribution of safety work to the common weal. Large will be the total, astonishingly large even to the initiated.

"Yet I contend that the total will not be complete. Something has been omitted—something of high value, for it works for peace and harmony in that great agency of our social mechanism — industry — through which millions of us win our daily bread. That something which you have omitted from the total is good-will—the good-will that flows from safety work that is honest and sincere."

### *Executive's Viewpoint*

**E. Posselt,** vice-president, International Cement Corp., New York City, speaking on the subject, "Safety from the Executive's Viewpoint," said that his company in the year 1930 paid nearly $42,000 in safety rewards to its employes. He said among other things, "It should be realized that the average American is dollar-minded and if the reward consists of cash, even in small amounts, he will enjoy the winning of such a prize way beyond its intrinsic value. Speaking from personal experience, I am sure the rather large amounts which my company paid out as safety awards from 1925 to 1931 have been a large factor in establishing safety in the minds of the men in our plants. The first year the amount paid out was quite substantial and it increased year by year. In 1930 we paid nearly $42,000 as safety rewards. That year finished a program during which the safety movement was well organized in every plant and it was considered that the large expenses necessary to initiate the movement would no longer be required. It was then decided to continue on a modified plan which could reach a maximum of $30 per year in each department with three years' continuous performance without a lost-time accident.

"We are continuing, however, the competition by departments for a safety cup and a cash reward. The name of the winning department each year is engraved on the cup, and the cash payment is made to each member of the department.

"It is to be hoped that conditions will soon permit the continuation of reasonable but adequate expenditures to retain or still further improve the splendid record of safety the cement industry has established."

### *Eye Hazards*

**J. B. Zook,** safety director, Great Lakes Portland Cement Co., in his paper, "Safeguarding Our Eyes," went quite thoroughly into the subject of eye accidents, with particular reference to the portland cement industry. He advised proper eye examination of all employes before employment. He discussed in detail some of the important eye hazards for the different operations of the industry and the kinds of goggles or glasses necessary for protection. He suggested the need of definite rules to meet these hazards.

"Every eye case," he emphasized, "must be sent to an eye doctor, no matter how trivial. Efforts of other employes to assist in these cases can cause an otherwise trivial case to become infected and infection following minor eye injury is the cause of many eye injuries becoming serious. Immediate first-aid treatment administered by a registered nurse, in which the eye is washed out, may often be all that is needed, but in every case where the foreign body is lodged in the cornea, the victim should be sent at once to the doctor. It has been shown that and 50% of all eyes lost through industrial accidents have been lost as the result of infection following a minor injury."

### *Keeping Safety Alive*

**M. V. Miller,** North American Cement Corp., winner of the National Crushed Stone Association's safety contest, discussed the statistics of the Berkeley, W. Va., plant and the continuous campaign since 1923 to win in a safety contest. His discussion was of more than ordinary interest because it went quite directly into details that interest everyone concerned with safety and that is, having once started safety work, to maintain undiminished interest in it.

Mr. Miller stated that after maintaining a good safety record until March, 1927, the organization slumped into old methods and it was evident the safety idea had become lost and a complete reconstruction was needed to maintain interest in the safety campaigns. The main reasons for failing to continue to produce were listed as (1) lack of cooperation among foremen and employes; (2) creating records that are only of local interest and not national, and (3) safety campaigns organized with enthusiasm and gradually passed aside until the idea was forgotten.

Starting out anew, the plant has been maintaining a safety campaign through a committee consisting of foremen from the various departments who hold monthly meetings, and in addition to this each foreman is designated for one month of the year to conduct a monthly safety rally. The foreman personally delivers a short talk and on some occasions secures the services of a non-employe, usually a local doctor or lawyer. The meetings are made really interesting as well as a constant reminder of the benefits secured from safe working.

As a result of these efforts, Mr. Miller considered that the organization had become really serious minded toward the promotion of safety and, as a result, minor injuries, unsafe practices and violation of safety rules are immediately reported. Good plant housekeeping is maintained, and the employes in general take pride in receiving commendations for their departments. He gave particular credit to the Portland Cement Association, the National Crushed Stone Association and the Bureau of Mines for the national safety contests which have gone a long way to maintain interest in safety work.

### *Quarry Industry Shows Progressive Improvement*

**W. W. Adams,** chief statistician, demographical division, United States Bureau of Mines, Washington, D. C., in his paper, "Recent Progress of Safety in the Quarry Industry," analyzed statistics in an interesting way to show that in the nine-year period 1922-1930 inclusive, the industry's accident-frequency rate decreased from 174 per thousand to 110 per thousand, or a reduction of 35% in nine years or 4½% a year. Of this reduction 10% occurred in the quarry proper and 56% in operations outside of the quarry. In the reduction of accidents in the quarry proper, the cement industry led with a decrease of 18% in five years, 1926 to 1930 inclusive.

Mr. Adams analyzed accident prevention statistics by states, showing that Illinois led, with New York second, in the progress of rate of accident reduction. He also compared accident rates in quarries producing dimension stone with those producing crushed stone, and in this comparison the progress of crushed stone operations in reducing accidents was quite impressive. Since 1922 the downward trend in accident frequency for all operations in and out of the quarry has amounted to 45% for crushed stone and 18% for dimension stone. Mr. Adams attributed the marked progress in safety at crushed stone operations to the accident-prevention programs fostered by the Portland Cement Association and the National Crushed Stone Association.

Mr. Adams then gave an analysis of the principal causes of accidents, with which quarry operators probably are already quite familiar, but which certainly can bear constant repetition. The first cause of accidents in both dimension and crushed stone quarries is falls or slides of rock or overburden. Haulage is another common cause.

Long-time accident-free records were cited to show that accidents can really be prevented. He mentioned particularly the record of the Pennsylvania-Dixie Cement Corp. at its No. 4 quarry at Nazareth, Penn., which has been six consecutive years without a fatal or lost-time accident. Other cement company records are those of the Ormrod quarry of the Lehigh Portland Cement Co. at Ormrod, Penn.; the Iola quarry of the Lehigh Portland Cement Co. at Iola, Kan.; the Sandt's Eddy quarry of the Lehigh Portland Cement Co. at Sandt's Eddy, Penn.;

the Mildred quarry of the Consolidated Cement Corp. at Mildred, Kan., and the Ironton limestone mine of the Alpha Portland Cement Co. at Ironton, Ohio.

***Community Work***

**H. D. Immel,** former director of the Bureau of Inspection, Pennsylvania Department of Labor and Industry, speaking on "The Economic Necessity for Community Safety Work and Its Relation to the Quarrying Industries," said among other things, "Years of study of the industrial accident problem in Pennsylvania convinced me that the community safety council is the best of all agencies for imparting safety consciousness to the community as a whole." He then went on to point out that in the organization of these community safety councils an industry, such as quarrying, where safety work has been organized, should take a leading part.

***Limestone Mining***

**D. Harrington,** chief engineer, Safety Division, United States Bureau of Mines, in a paper, "Safety in Limestone Mining and Quarrying," discussed at considerable length statistics of the quarrying industry and their interpretation. He quoted many quarry safety records to show that quarries can and have operated for long periods of time without a lost-time accident.

With particular reference to limestone mining, he said in general the hazards are generally from defective ventilation, poor illumination, use or rather misuse of internal combustion engines underground, carelessness in storing, handling and firing of explosives underground, as well as in safeguarding various dangers from underground haulage which confront nearly all underground mines. One hazard which he said is nearly universal but the existence of which would probably be denied is that of mine fires caused from timber, explosives, oil, grease or other combustibles which are left promiscuously underground.

As a preventive of quarrying and mining accidents, Mr. Harrington said the education of the employer and his agents in responsibility for accidents was still of prime consideration. He recommended that every employe be given a physical examination at least once a year and all applicants for employment be given an examination before being placed on the payroll, with particular attention being paid to vision, condition of heart, hernia, etc.

Mr. Harrington also recommended that every employe be trained in an up-to-date course in first-aid and that definite efforts be made to secure the cooperation of all workers by some sort of awards of bonuses or contests or competitions for safety suggestions or for individual safety performance or for safety performance of some unit of the organization of which they are members. Where "bull-headed" persons are encountered who refuse or fail to cooperate, he recommended drastic disciplinary methods.

# Many Participate in Safety Trophy Dedications

## Olympic, Lawrence, Southwestern and Ash Grove Feature Safety at Dedication of Portland Cement Association Trophies

AMONG PLANTS which have dedicated safety trophies in recent weeks are the Olympic Portland Cement Co., Bellingham, Wash.; the Thomaston, Maine, plant of the Lawrence Portland Cement Co.; the Osborn, Ohio, plant of the Southwestern Portland Cement Co., and the Louisville, Neb., plant of the Ash Grove Lime and Portland Cement Co.

***Ceremony at Olympic***

The Olympic Portland Cement Co. dedicated its safety trophy on August 25. The occasion attracted several hundred visitors from Bellingham and vicinity. Among the distinguished visitors was Governor Hartley, who, for the second time in two weeks, was the speaker of the day at a Portland Cement Association trophy dedication.

Frank J. Barrett, district engineer of the Portland Cement Association, made the customary speech of presentation of the trophy. A. F. Krabbe, general superintendent, accepted the trophy on behalf of the plant organization, after which Governor Hartley was introduced as the speaker of the day.

The last accident at the Bellingham plant occurred December 9, 1930.

***W. M. Kinney Presents Lawrence Trophy***

The safety trophy for 1931, won by the Thomaston plant of the Lawrence Portland Cement Co., was unveiled and dedicated August 27.

O. E. Wishman, safety engineer of the plant, made the opening address. J. G. Thompson acted as master of ceremonies. C. H. Sonntag, plant manager, welcomed the guests.

There were safety addresses by Charles O. Beal and W. J. Brennan, after which the trophy was dedicated by W. M. Kinney, general manager of the Portland Cement Association. It was accepted on behalf of the company organization by Marion S. Ackerman of New York.

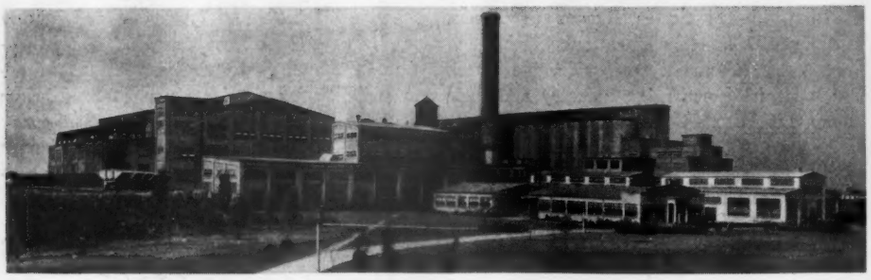
At the conclusion of the ceremonies the visitors were conducted through the plant on a tour of inspection, after which dinner was served. Music was provided by the Rockland City Band.

***1500 Attend Southwestern Dedication***

On September 17 employes of the Osborn plant of the Southwestern Portland Cement Co. celebrated last year's perfect safety record with a day of continuous gala events.

At least 1500 persons attended. In addition to plant officials and employes and their families and neighbors there was a large party of guests, including many of the leading industrialists of southwestern Ohio, sev-

***Barbeque following dedication at plant of Southwestern Portland Cement Co., Osborn, Ohio***



*Trophy dedication at Olympic Portland Cement Co.*

eral hundred members of the Dayton Foremen's Club, officials of the company, of the Ohio Industrial Commission and the Portland Cement Association.

Frank H. Powell, president of the company, journeyed from his home in Los Angeles for the occasion; J. B. John, president,

The day's program included a schedule of games and contests for young and old; clowns to amuse the smaller children, the dedication ceremonies, a barbeque dinner and a dancing party. The mill, with its 12 acres of beautifully landscaped park and lawns, presented a picture of industry idealized—

*Plant of Southwestern Portland Cement Co., Osborn, Ohio*

and E. J. Maguire, vice-president and treasurer of the Medusa Portland Cement Co., motored from Cleveland; A. J. R. Curtis, of the Portland Cement Association, came from Chicago.

the workshop and the social center combined.

Following opening remarks by W. T. Groner, superintendent, the trophy was presented by A. J. R. Curtis, assistant to the general manager, Portland Cement Associa-

***Group at trophy dedication at Osborn***

Front row, left to right: E. J. McGuire, president Medusa Portland Cement Co.; J. B. John, president and manager, Medusa Portland Cement Co.; H. S. Smith, vice-president Dayton Chamber of Commerce; F. H. Powell, president Southwestern Portland Cement Co.

Back row, left to right: W. J. Jennings, manager, and W. T. Groner, superintendent, Southwestern Portland Cement Co.

***T. P. Kearns***

tion. The trophy was accepted for the employes by O. R. Cornelius, safety director, Southwestern Portland Cement Co., following which F. H. Powell and J. B. John each made an address. H. L. Sabin, special representative, Industrial Commission of Ohio, spoke briefly of the accomplishment of the plant, after which Thos. P. Kearns, superintendent, division of safety and hygiene, Industrial Commission of Ohio, gave the dedication address.

### *Large Attendance Also Features Ash Grove Dedication*

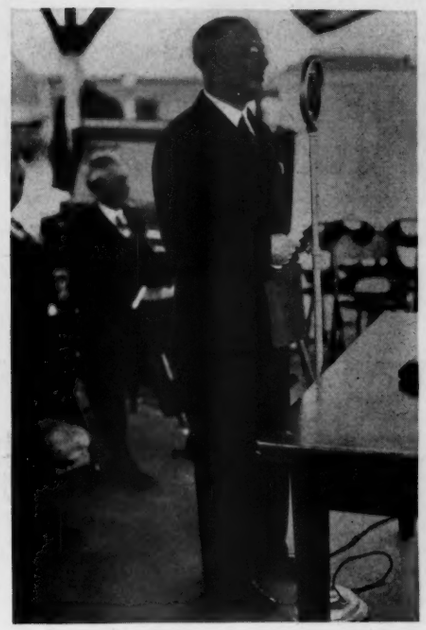
Governor Bryan of Nebraska was the principal speaker at the dedication ceremonies at the Louisville plant of the Ash Grove Lime and Portland Cement Co. September 24. The occasion was the outstanding industrial event of the year in that vicinity, with an attendance of about 1000, including guests representing state, labor and compensation officials, and major industries of eastern Nebraska.

At noon a party of 28 visitors and company officials were the guests of President L. T. Sunderland at a dinner in honor of Governor Bryan. The dedication ceremonies were followed by escorted inspection trips through the plant. Later, employes and their families were entertained in the adjoining park by the Ash Grove Band and the Old Time Orchestra, after which a picnic supper was served.

Plant Superintendent Frolich presided at the formal ceremonies in the plant park. A. J. R. Curtis, secretary of the committee on accident prevention of the Portland Cement Association, presented the monument on behalf of the association.

The trophy was accepted on behalf of the plant organization by D. W. Webb, chairman of the safety committee. H. N. White-

*J. B. John*



*A. J. R. Curtis*

*F. H. Powell*

bread, a veteran employe of the Ash Grove company, expressed the gratitude of the workers, and G. O. Gardner, superintendent of the Ash Grove plant at Chanute, conveyed the congratulations of the sister plant.

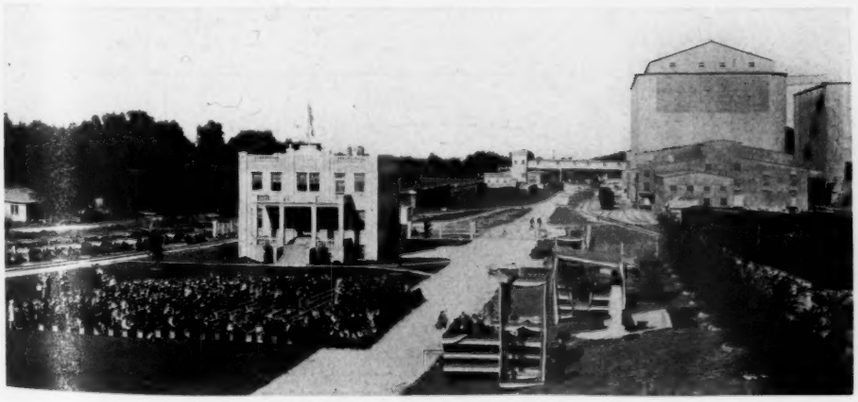
President Sunderland introduced Governor Bryan and said: "We are assembled today to celebrate an Ash Grove 1931 victory, of which I am more proud than of any other achievement within the history of this company.

"I wish to felicitate Superintendent Frolich and his loyal organization upon their splendid 1931 achievement in operating this plant for an entire year without bringing death or disabling injury to any Ash Grove employe, or bereavement or sorrow to any home. I also congratulate Mr. Frolich and his staff upon winning the Portland Cement Association trophy.

"This celebration comes also as a fitting commemoration of the 50th anniversary of the founding of the Ash Grove company in the year 1882."

Governor Bryan told of the large quantities of cement which the state of Nebraska was purchasing for road work this year.

*C. R. Titlow*



***Dedication at the Louisville, Neb., plant of the Ash Grove Lime and Portland Cement Co.***

## Mine Safety Record Made by Cement Industry

"THE Alpha Portland Cement Co.'s mine at Ironton, Ohio, has established a safety record for an underground mine which is probably the best of which we have been able to get information to date," said Dan Harrington, chief engineer of the safety division of the U. S. Bureau of Mines, upon being informed of the establishment of a six consecutive year safety record by the employes of this mine. The announcement was made through the Bureau of Accident Prevention and Insurance of the Portland Cement Association.

On September 27, 1932, the employes of the Ironton mine had succeeded in operating a total of 2197 days, or over six years, without a lost-time, partial disability or fatal accident. There was an average of 63 employes for this period, having a man-hour exposure of 569,848.

The best safety record ever established by a coal mine, according to information furnished by the United States Bureau of Mines, is 475 consecutive days with 509,232 man-hours exposure. This was set by a mine in Virginia which employed approximately 250 men.

A mine in Michigan holds first place among metallic mines with a record of 591 consecutive days without accident, covering 365,129 man-hours exposure to 103 employes.

Neither of these records approaches, either in days duration or man-hours work, the record of the Ironton mine, which is still operating without mishap.

# Cement Products

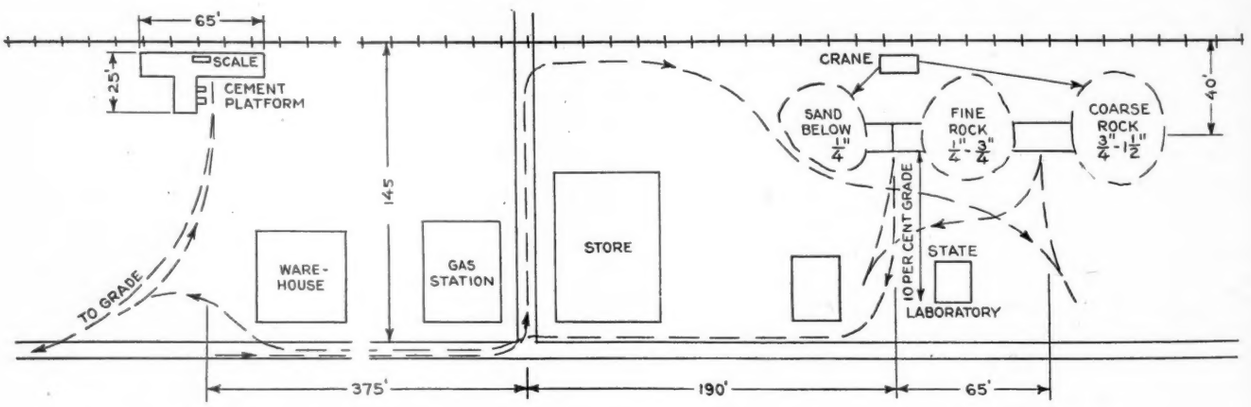


## Desirable Layouts for Batching Plants Making Paving Concrete

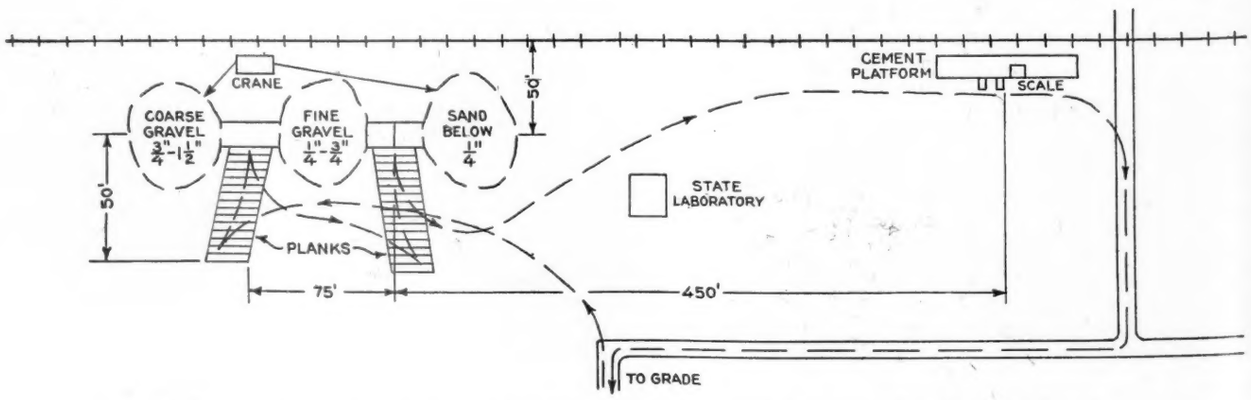
ANDREW P. ANDERSON, highway engineer of the U. S. Bureau of Public Roads, with the thought of batching for paving concrete, has described layouts and given figures, applicable to any batching plant, in the August issue of *Public Roads*.

The plants described are to supply a 27E paving mixer with 45 to 55 batches per hour. They consist of a crane with a 1-yd. or 1½-yd. bucket, one or two bins with batch weighers and a cement loading platform or cement bin. There must usually be storage for at least one day's supply of cement. The crane should maintain an average cycle of 30 sec. A table shows the average of 10 jobs and the cycle for sand was 25.6 sec. and for gravel 26.7 sec. The crane may be speeded up by working on a runway 6 to 7 ft. high, so that the operator can see into the cars. This can be built of coarse aggregate and cleaned up with the last of the job. If ground space will permit, by building a plant with track hoppers from which the material can be taken by belt or crane, some operating time will be saved. If coarse aggregate is in two sizes a 3-compartment bin should be used. Two bins will add from ½ min. to ¾ min. per batch to the time constant of the trucks. The capacity of the bins should be at least one hour's run of the mixer. Reserve storage in bins is cheaper than in trucks.

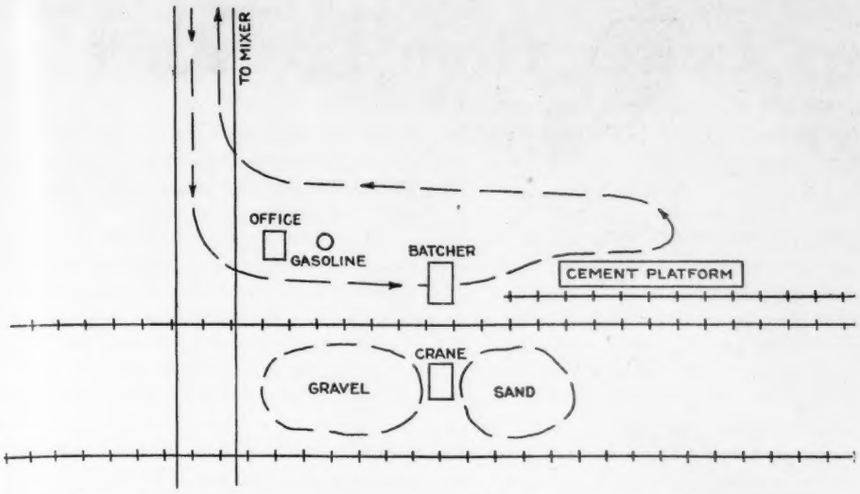
For cement it is better to have a platform on to which the bags are wheeled from the car to be loaded directly on the truck. This part of the layout should be studied so that the bags may be put on the truck without any rehandling or moving around. The platform should be about 6 in. higher than the truck body and placed so that trucks can drive very close. If not the bags have to be tossed on the truck by hand which takes from 10 to 15 man-seconds per bag. Bulk cement is commonly handled by buggies. The platform for this should be long




*A—Time consuming layout; two sizes of coarse aggregate; bulk cement handled with buggies*




*B—Improved yard layout; two sizes of coarse aggregate; bulk cement handled with buggies*




***C—Convenient yard layout for one size of coarse aggregate and bag cement***

TABLE 3. YARD TIME CONSTANTS, IN SECONDS, FOR LAYOUTS SHOWN

| | Layout *A* | | Layout *B* | | Layout *C* |
|---|---|---|---|---|---|
| | 1-batch trucks | 2-batch trucks | 1-batch trucks | 2-batch trucks | 2-batch trucks |
| Loading aggregates | 10 | 68 | 11 | 70 | 27 |
| Loading bulk cement and adjusting tarpaulins | 33 | 40 | 33 | 53 | .... |
| Loading bag cement | .... | .... | .... | .... | 37 |
| Driving within yard | 90 | 110 | 51 | 59 | 71 |
| Turning and backing | 74 | 97 | 22 | 30 | .... |
| Fixing batch boards | .... | 18 | .... | 19 | .... |
| Total net yard constant | 207 | 333 | 117 | 231 | 135 |
| Average waits and delays | .... | .... | .... | .... | 15 |
| Total gross yard constant | .... | .... | .... | .... | 150 |
| Driving distance within yard, in feet | 800 | 800 | 875 | 875 | 250 |

TABLE 4. EFFECT OF YARD LAYOUT AND MANAGEMENT ON TIME CONSTANT

| | | | | |
|---|---|---|---|---|
| GOOD YARD LAYOUT AND ABLE MANAGEMENT | | | | |
| Number of studies averaged | 3 | 3 | 3 | 3 |
| Size of trucks | 1-batch | 2-batch | 3-batch | 4-batch |
| Load aggregate, seconds | 10 | 38 | 70 | 98 |
| Load cement bags, seconds | 12 | 29 | 54 | 84 |
| Drive and maneuver, seconds | 48 | 65 | 87 | 62 |
| Total net yard constant, seconds | 70 | 132 | 211 | 244 |
| AVERAGE YARD LAYOUT AND MANAGEMENT* | | | | |
| Size of trucks | 1-batch | 2-batch | 3-batch | 4-batch |
| Load aggregate, seconds | 15 | 59 | 114 | 190 |
| Load cement bags, seconds | 28 | 80 | 106 | 110 |
| Drive and maneuver, seconds | 81 | 99 | 102 | 100 |
| Total net yard constant, seconds | 124 | 238 | 322 | 400 |
| POOR YARD LAYOUT AND SLACK MANAGEMENT | | | | |
| Number of studies averaged | 3 | 3 | 3 | 3 |
| Size of trucks | 1-batch | 2-batch | 3-batch | 4-batch |
| Load aggregate, seconds | 33 | 91 | 163 | 196 |
| Load cement bags, seconds | 51 | 89 | 118 | 148 |
| Drive and maneuver, seconds | 210 | 218 | 193 | 132 |
| Total yard constant, seconds | 294 | 398 | 474 | 476 |

*Average values for more than 100 jobs.

enough so that two railroad cars may be unloaded at once. That part of the buggy track that extends over the truck should be hinged at the platform edge and provided with counterweights to hold it almost vertical until it is pushed down by the advancing buggy wheels. A canvas boot to reach into the aggregate or the cement container should be provided with protection to keep the wind from whipping up the cement as it is dumped. It takes 192 to 208 man-seconds per buggy of 630 lb. of cement.

There are three methods of truck loading, dumping the cement in between two of the aggregates, dumping cement on top of the batch and covering with a tarpaulin, and carrying the cement in a special container. The first is the fastest when two aggregate bins are used. The second requires 15-30 sec. to roll back and tie the tarpaulin. The special cement containers are far from standardized and in general about 25-45 sec. are required for loading one of them.

The cuts, *A*, *B* and *C* show 3-cu. yd. layouts (*C* being a simple layout for using one size coarse aggregate) and Table 3 gives the yard-time constant for the three. It is noteworthy that the better layout of Yard *B* cuts the time almost one-half for 1-batch trucks and one-third for 2-batch trucks.

Good management is equally important to good layout. The loss of truck time costs 2 to 5 c. per min. and of mixer time $0.75 to $1 per min. The yard should never be allowed to become the pacemaker instead of the mixer. The trucks should be routed through the yard so there will be no interference with the various units.

A table gives the effect of good yard layout and management, taken from a study of 24 typical batching yards, which is reproduced here. The time differential of the good against the poor layout and management averages about 4 min., and from 1 to 3 min. over the average yard.

## Concrete Pipe Culverts and Precast Headwalls

A COMPREHENSIVE STUDY of concrete pipe culverts, based on many years of actual service, has been published by the American Concrete Pipe Association, Chicago, Ill., as Bulletin 12.

The bulletin reports the results of field investigations by engineers of the association in a number of states and under practically all types of service conditions. Actual photographs show the condition of a number of culverts. Details of a number of unusual types of installations are also shown.

Of particular value, from an engineer's viewpoint, are the discussions on double and triple reinforced concrete pipe culverts built in tidal swamps, jacking concrete pipe through fills, reinforced concrete pipe culverts under heavy, sliding fills, bedding and backfilling culvert pipe, the right and wrong way to lay pipe, constructing concrete pipe culverts in tunnel, concrete pipe of light design sustains heavy impact loads, hydraulic capacity of concrete and corrugated metal pipe culverts, determining the proper size of culverts, and precast headwalls.

In discussing precast headwalls the bulletin says, "The use of precast concrete headwalls for reinforced concrete pipe culverts has grown rapidly in recent years. These units can be transported to the job and installed with the pipe, minimizing construction costs and eliminating uncertainty of quality of small scale construction in the field." Concrete pipe manufacturers who have not considered this as a possibility for additional revenue might find it worth full investigation.

## To Mix Hoover Dam Cement

TO INSURE a uniform color, cement shipments to Hoover Dam, which are being made from four plants, will be stopped en route at the Oro Grande plant of the Riverside Cement Co., where they will be mixed to blend their color.

# Ed. Shaw's News Letter from Los Angeles

WHEN I was more interested in solving the problems of sand production than I was in writing about them, I thought that most of those problems could be reduced to two words, fine sand. Most of the methods and the contraptions that were devised were for the purpose of getting rid of it, although occasionally someone would want a "hope chest" to catch some of the stuff, the hope being really that someone else would buy it for core sand or asphalt sand or for some unknown purpose in sufficient quantity to pay for putting in the device to recover it.

Except for such absolutely strength destroying impurities as tannic acid, fine sand in any quantity was thought to be about the most deleterious of materials. It was, of course, always recognized that a certain small quantity rather improved workability, but it was supposed that there would always be enough for that. The thought about it may be judged by the minimum of material passing 50-mesh in sands permitted by the important specification-making bodies. The U. S. Master Specification No. 464 permitted as little as 5%, 19 state highway departments called for 5% and the A. S. T. M. specification C 33-28 T, as little as 2%.

Undoubtedly this condemnation of fine sand was founded upon the solid fact that the finer sizes of sand require a much greater water-cement ratio when made into concrete than the coarser sands. I recall reading in a bulletin on farm concrete issued by the U. S. Department of Agriculture that fine creek bed sand needed seven times the cement that a well graded sand would need to make concrete of equal strength. And of course more than one failure has been traced to the use of beach sand or its like in a 1-2-4 or similar mixture. No need to multiply instances. Every early investigator of concrete pointed out that much fine sand weakened the strength of a mix and the discovery of the water-cement ratio disclosed as a reason the large area that had to be wetted if fine sands were used.

Occasionally a writer had a good word to say for fine sand. The writers of the 1924 Joint Committee Specification were evidently in advance of their time when they called for a minimum of 10% passing 50-mesh, for no other specification called for so much. Gonnerman in his 1929 A. S. T. M. paper said no more than: "When sand is deficient in fines, that is, material passing the No. 50 or the No. 28 sieve, increasing the sand percentage (the common method of securing smoother working concrete) will not produce real workability or prevent segregation except in rich mixtures." But he does, however, quote the Germans, Merkle and Graf. The former recommended 15% passing 0.5 mm. (35-mesh, U. S. Std.) and the latter 25% passing 0.24 mm. (60-mesh, U. S. Std.).

The average of these is about right according to what I have been told of the research work that has been going on in several laboratories here on the Coast, the maximum size of sand being ⅜ in. Practice, based on experience, has shown in some cases that the minus 50-mesh could be as much as 20% with only beneficial results. This, it must be remembered, applies to the somewhat coarse and angular sands in this part of southern California. For it is also being shown that the shape of the grain greatly affects the amount of fines required for a good blend. Anyway, the practice of blending with fine sand to promote workability is now quite common here and it is done on both public and private work.

### *Fine Sand Added to Concrete Mixtures*

Some four years ago, D. L. Holmes, then a field man for the Portland Cement Association, told me that he thought the "sand runs" which occasionally disfigured exposed concrete were due to too little fines, making a mix that would not hold the water. I think now that this is the correct explanation. Then Stanley Hands told me that he had added 100 lb. of beach sand to the yard of concrete and actually decreased the water-cement ratio for the same slump and workability. I believed it, of course, but thought it must be explained by some unusual qualities or characteristics of the sand. Some engineers with whom I talked about it were frankly skeptical. But I have since seen the same thing in experiments made under the most careful laboratory conditions, not one but several of them.

I am sorry I cannot speak of more than one or two of these, for the results are mainly from a series of tests that are to be published later. However, I was called in especially to see one set of such tests and can give the figures. These were made at the Osborne laboratories here by Harold Whittlesey, who is both architect and construction engineer of the proposed public market for Long Beach, Calif.

In making the excavations for this work a fine sand strata was found and Mr. Whittlesey thought it might be used to improve the quality of the regular concrete sand that he could buy in the open market. It was 85% passing 50-mesh, and enough of it was added to raise the minus 50-mesh in the regular sand to 16.9%. At the same time a correction was made in the coarse aggregate. This was all through 1-in., and retained on ¼-in. and 46% was between ¾-in. and ⅜-in. This was rearranged so that the final grading of the complete aggregate followed the grading recommended by Prof. Furnas, the weight on each sieve of the regular A. S. T. M. testing series being 1.2 times the amount on the sieve below it.

Tests were made for workability and slump with water-cement ratios of 0.8, 0.9 and 1.0. As a correction for absorption by the dry aggregates, water amounting to 3% of the weight of the sand was added, not enough in the writer's opinion. But this did not matter, as the results were wholly comparative.

With the sand and coarse aggregate graded as bought, the mix was harsh and stiff, with a water-cement ratio of 0.8. The slump was only ½-in. At 0.9 w/c the workability was somewhat better and the slump was 1-in. At 1.0 w/c the workability was fair and the slump was 6-in., the slump that was desired.

With the better graded aggregate the mixture was quite workable at 0.8 w/c and the slump was 1¼-in. At 0.9 the mix was very smooth and workable—what would usually be called excellent. The slump was 6-in.

### *Water-Cement Ratio Reduced by Fine Sand*

Here, then, is a case, without a doubt, of lowering the water-cement ratio for the same slump or consistency by the addition of a considerable quantity of fine sand, not to speak of the improvement in workability. The strengths, according to Gilkey's tables, would be 2000 lb. and 2340 lb., an increase of almost 22%.

I showed these figures to an engineer who is making a large number of tests for a big construction job, including tests of blending with fine sand. He matched them from his own records, although the lowering of the water-cement ratio was not noted in every case. What he did find regularly was decidedly better workability with a slightly better consistency and equal strengths. I got the same idea when discussing the blending of sands with H. S. Cortelyou while preparing for the article which appeared in the July 30 issue of Rock Products. This described the satisfactory results from blending with fine sand in structural concrete.

So, for this locality at least, it seems that 17 to 20% should pass 50-mesh. And if there are not fines enough for that it is well to add some for better workability and perhaps an improvement in strength. But it is to be hoped that this will not lead anyone to an indiscriminate throwing of fine sand into concrete aggregate, doing the thing to death, as so many new things in concrete have been done to death. What we need in America is a knowledge of "The Middle Way," what the wise old Chinese philosopher spoke of as the "road of neither too little nor too much."

## City Building Shows Appreciable Increase

ACTIVITY in the building trades expanded in August in the country's larger cities, according to the Bureau of Labor Statistics, U. S. Department of Labor.

Permits issued in 352 cities showed an increase of 4.5% in the estimated cost of the structures or $37,137,073, compared with $35,548,679 reported in July permits.

The increase was chiefly in residential buildings, which showed an advance of 20.6% in prospective costs. Non-residential construction declined 3.7%, while additions, alterations and repairs moved upward 10.1%, it was stated.

Various agencies of the Federal Government awarded contracts during August for buildings to cost $11,936,074. This is an increase of nearly $2,000,000 as compared with July, but less than one-half of the value of contracts awarded during August, 1931.

Permits were issued during August, 1932, for the following important building projects: In Trenton, N. J., for a factory building to cost $200,000; in the Borough of Manhattan, for a public building to cost $500,000 and for a store building to cost $500,000; in Chicago, for a store building to cost nearly $700,000; in Wilmington, Del., for a school building to cost nearly $400,000; in Washington, D. C., for two institutional buildings to cost nearly $700,000 and for a school building to cost over $300,000. Contracts were awarded by the supervising architect, Treasury Department, for a postoffice in Lynn, Mass., to cost over $300,000; for a postoffice in Philadelphia to cost nearly $4,500,000; and for a postoffice in Lexington, Ky., to cost over $400,000.

## Report Good Outlook for Gravel in Pittsburgh District

SAND AND GRAVEL operators of the Pittsburgh, Penn., and Kanawha river districts are looking forward to supply a heavy tonnage of their product in the near future. River dredges and towboats will be required to produce and transport large quantities of sand and gravel for the construction of approximately 57 mi. of highways and a number of small bridges in Kentucky. Bids for this work will be opened within a few weeks.—*Pittsburgh* (Penn.) *Post-Gazette.*

## Gravel Crushing Plant for Prince Edward Island

A TRACT of 150 acres of land near Conway, Prince Edward Island, has been bought by the Warren Bituminous Paving Co., according to the industrial department of the Canadian National railways. The company will erect a gravel crushing and screening plant on the property at a cost of $50,000. The plant is expected to be able to produce 10 carloads per day.

## John J. Porter, President North American Cement Corp

JOHN J. PORTER, former vice-president and general manager of the North American Cement Corp., Albany, N. Y., has been elected president of the corporation, succeeding the late Frederick W. Kelley.

Mr. Porter was born in Washington, D. C., June 14, 1880; he graduated in chemistry at the University of Cincinnati in 1902. From 1902 to 1906 he was chemist and superintendent of the Alleghany Ore and Iron Co., chemist of the Dubois Furnace Co. and foreman of the Illinois Steel Co.

In 1907 he returned to the University of Cincinnati as assistant professor of metallurgy, where he remained until 1912, when he entered private practice as a consulting

***John J. Porter***

metallurgist. The Security Cement and Lime Co. in 1913, having come to regard cement manufacture as related to metallurgy, being one of the first cement manufacturers to realize that the industry required something more than rule-of-thumb methods, obtained Mr. Porter's services in 1913 as first vice-president and general manager.

Since then Mr. Porter has been an outstanding figure in the portland cement industry and is recognized both in this country and abroad as one of the outstanding scientific authorities on portland cement and its manufacturing technique. When the North American Cement Corp. was organized to include the Security company, Mr. Porter became vice-president and general manager of the larger company. He is prominent in all the technical committees and work of the Portland Cement Association and is a member of numerous technical and scientific societies.

## Relief Highway Funds

WIDE MISUNDERSTANDING exists as to why the books of the R. F. C. show that only a small part of the $120,000,000 set aside for emergency highway construction has been taken up by the states. Many believe it to be a sign that nowhere near the full amount authorized will be used, that the states are not alive to their opportunity to get money for needed work. The opposite is actually the case. The states are alive to their opportunity. The misunderstanding is due to a lack of knowledge of the workings of federal aid to highways. The states cannot go to the federal treasury and draw the amount allotted to them. They must first decide on each highway job for which they will ask for funds, must prepare their plans and estimates and present them to the U. S. Bureau of Public Roads for approval. If approved, bids must be called and ultimately a contract let. *After* the contract has been let for each job the federal-aid money becomes available. There need be no cause for worry that the money will not be used; our state highway departments are well organized and ready and are pushing their plans through to the contract stage as quickly as possible. The chief cause for worry centers in the amount of work on self-liquidating projects that can be made available to relieve unemployment this winter. If plans for such projects were as well along as are the highway plans increased employment would spread more generally into the larger centers of population.—*Engineering News-Record.*

## Reports on Prospect for Cement Industry

REDUCTION of available stocks of cement to the equivalent of hardly more than two months' consumption and the government's relief program providing funds for road building have led to revived operations in the cement industry which promise to be of considerable aid in increasing employment, the *New York* (N. Y.) *World-Telegram* reports.

This information was gained from G. S. Brown, president of the Alpha Portland Cement Co. at Easton, Penn. The company has increased production as a result of faith that work would proceed at once under the relief road construction program for which federal funds have been provided, particularly in southeastern states where winter weather is not likely to be a handicap for immediate activity.

The statistical position of the industry is regarded as particularly inviting to marked speeding up, even with only partial realization of road building and construction plans.

# New York State Crushed Stone Association Fighting Gas Tax Diversion

THE first fall meeting of the New York State Crushed Stone Association was held at the Mohawk Golf Club, Schenectady, N. Y., Wednesday, September 21. J. Edward Cushing, president of the Cushing Stone Co., Schenectady, was host.

After the customary luncheon the meeting was called to order by the president, J. L. Heimlich. At the beginning of the meeting all of the association's regular business was postponed to allow representatives of the New York State Construction Council to report the progress already made by this organization and to give an outline of its future plans. Another important matter was to make a plea for funds to continue the Council's work.

Harold V. Owens, chairman of the executive committee of the New York State Construction Council was the first speaker and he outlined the purpose of the Council. He was followed by Thomas E. Wright, executive secretary, who gave a good account of what had been accomplished so far and what it was planned to do if funds were made available to continue the Council's activities. Then G. J. Ward, publicity director of the Council, spoke on the publicity campaign that had been outlined.

The meeting was then opened for further discussion or questions regarding the purposes and principles of the Council, which were ably and completely answered by Messrs. Owens, Wright and Ward. The Portland Cement Association has pledged its support to the Council, not only the help of L. N. Whitcraft, district engineer, but has approved a contribution of $28,000 to help make possible the work of the Council.

In the tentative budget of $100,000 planned by the Council, the New York State Crushed Stone Association was asked to give consideration to an appropriation of $15,000. This was discussed in the closed meeting of the association and a committee of two, consisting of Mr. Heimlich, president, and Mr. Schaefer, secretary, was appointed to prorate this amount among the members, who will be asked to contribute according to their production or ability to pay. All members of the association present agreed that the work of the Council was of the utmost importance and that they would do everything in their power to back it and help it accomplish its purpose.

Practically the entire meeting was given over to the work and needs of the New York State Construction Council, and there was little time devoted to the crushed stone association's own business. So it was decided that another meeting be called next month, the time and place to be announced by President Heimlich in the next few weeks.

The code of principles, purpose and activities of the New York State Construction Council was published in full in Rock Products, August 27.

Since then the Council has sent an open letter to all New York state legislative candidates, worded as follows:

### *An Open Letter to All Legislative Candidates*

The New York State Construction Council, Inc., is composed of such individuals and organizations in the state of New York as are interested, first, in fair and reasonable taxation; second, in sensible and economical public works policies; and third (at this particular time) in the proper distribution and expenditures of revenues from road taxes. (Motor fuel and motor vehicle revenues are referred to here.)

In so far as their activities and markets deal with public works construction, the members of this Council are engaged in a public service industry. The business interests of the Council's members, we believe, will be served best through the medium of a public works program designed to give maximum return to the public and fitted to the taxpayers easy ability to pay. The purpose of this Council, therefore, is to further, by every fair and legitimate means in its power, the inauguration and prosecution of such a public works policy.

To this end the New York State Construction Council therefore opposes the diversion of any part of the revenues from motor fuel and motor vehicle taxes for any other use or purposes whatsoever than as prescribed by the law as originally passed when such taxes were levied. We believe that to do so is unfair to motor vehicle owners; that it constitutes class taxation; that it is contrary to the theory and purpose of these taxes; that it tends to encourage and conceal extravagance in other departments of government; and that in New York state it is in direct violation of the laws made when these taxes were instituted, and to promises made to the motorists at that time.

These laws are as follows:

Subdivision 3 of Section 289-D of the Tax on Gasoline and Similar Motor Fuel Law, relative to the distribution of the 2 c. gasoline tax, provides that the 75% retained by the state, after refunds to all counties and the city of New York have been made, shall be paid into the state treasury and *"shall be appropriated and used for the construction, maintenance and repair of highways and bridges under the direction of the Superintendent of Public Works."*

Subdivision 4 of Section 73 of the Motor Vehicle and Traffic Law provides that *"all moneys paid into the state treasury pursuant to this article shall be appropriated and used for the construction, reconstruction and maintenance and repair of highways and bridges under the direction of the Superintendent of Public Works."*

One of the proposed activities of the Council in connection with the approaching legislative session is to oppose any changes in, or modification of, the above mentioned laws for purposes of diverting from highway uses any part of the revenues derived therefrom. Another proposed activity in connection with legislative matters is to favor and urge that the disposition of revenues from motor fuel and motor vehicle taxes shall be dedicated by an amendment to the state constitution to highway use only and as originally prescribed by law.

To this end it is the purpose of the Council to actively support, in an absolutely nonpartisan and fair manner, candidates for public office who declare themselves in accord with the above purposes and principles, and who pledge their efforts toward furthering same.

Please note the attached questionnaire, through the medium of which the New York State Construction Council respectfully requests that you indicate just where you stand in favor of, or in opposition to, the diversion of motor vehicle fees and gasoline tax revenues from highway purposes as originally prescribed by law, and as to whether or not you will favor and vote for making the disposition of such revenues a constitutional amendment.

As a candidate for the legislature you are requested to fill in, sign and return this questionnaire at your earliest convenience. Failure to return this will of necessity have to be considered as indicating that you do not oppose the diversion of the revenues from motor vehicle fees and gasoline tax from highway purposes, and that you do not favor making the disposition of such revenues a constitutional amendment.

### *Questionnaire*

As a candidate for the legislature of the state of New York you are respectfully requested by the New York State Construction Council, Inc., to indicate below your views and intentions in the matter of legislative disposition of revenues from motor vehicle and motor fuel taxes.

1. Do you favor devoting all revenues derived from motor vehicle fees and gasoline tax to highway purposes as set forth in Subdivision 3 of Section 289-D of the State Tax Law, and Subdivision 4 of Section 73 of the State Motor Vehicle and Traffic Law?

YES ..... NO .....

2. Are you opposed to, and will you protest and vote against, any attempt to change these laws for the purpose of diverting any part of the revenues derived thereunder from highway purposes?

YES ..... NO .....

3. Do you favor, and will you vote in favor of, an amendment to the state constitution dedicating all revenues from motor vehicle and motor fuel taxes to highway use only and as originally prescribed by law?

YES ..... NO .....

Please answer all three (3) of the above questions by placing a cross mark (X) in the spaces provided therefor, following which this questionnaire is to be signed in full and returned to the New York State Construction Council, Inc., in the attached addressed and stamped envelope.

Signed.....

Address (P. O.).....

Date.....1932

## To Announce Construction Program Plans

APPROXIMATELY 400 building projects, each costing less than $300,000, will be announced soon to complete the rest of the $100,000,000 building program authorized by the Emergency Relief and Construction Act, it was stated recently.

The Treasury and Post Office Department already have announced 41 public building projects, estimated to use $53,690,000 of the $100,000,000 and each costing more than $300,000.

## Plans for the Highway and Building Congress

INFLUENTIAL national organizations interested in highway and building activities will join in holding a combined 1933 Highway and Building Congress, as already announced in previous issues of ROCK PRODUCTS. The week of January 16 has been selected as the time for the meeting, and Detroit the place. In previous years each of the associations taking part has held its separate convention. Therefore, the bringing together of the numerous groups for joint consideration of mutual problems at one time and place is an innovation. It marks the beginning of what should prove to be mutually advantageous, coordinated activities, and a more valuable service on the part of highway and building interests to the country as a whole.

### *The Program Schedule*

On the first three days of the Congress, separate meetings of the individual associations taking part in the Congress will be held. Thursday, the fourth day, will be devoted to highways, and Friday, the final day of the Congress, to building and general construction. By such an arrangement of programs each participating association will retain its individual identity, conducting its usual convention program in its separate meetings on the first three days. All will merge individual aims in staging the programs of the highway sessions on Thursday and the building and general construction sessions on Friday. On these two days addresses relating to general highway and building problems will be presented by outstanding leaders.

### *Congress Objectives*

The principal objective of the Congress will be to focus public attention upon the economic advantages of highway and building activities. Attempts will be made to solve many of the problems and difficulties general to all groups. Efforts will be directed toward plans for coordinating the financial, contractual, engineering, material and equipment interests of which the highway and building industry as a whole is composed.

The several associations will contribute to the normal and essential progress in highway and building technique through their separate meetings. No less importance will be attached to the exchange of ideas as to improvements in design and methods through experience and research as usually carried on by the individual organizations jointly and severally.

External conditions, however, impose an immediate obligation upon every component part of the construction industry to rise above individual aims and to take its part in an intensive educational effort to assure a continuation of highway and building programs upon a reasonable and rational basis. The Congress plans are the outcome of a keen appreciation of these circumstances by association leaders.

A wide scope of problems face the Congress. For example, in the highway field particular effort is immediately urgent to emphasize the wisdom of conserving highway revenues for highway purposes. If threatened diversions of motor vehicle and gas tax funds occur, progress in highway development will suffer a drastic curtailment. To offset such unsound tendencies as these, savings through lower transportation costs, and the increased convenience and safety of improved roads, must be made more widely known. Further, the progress of the entire highway and building industry in improving methods, and increasing efficiency and economy of construction, must be translated into terms of value to the taxpayer. The importance of highway and building operations for the welfare of every community must be interpreted, not only in direct construction benefits, but in the increased purchasing power of construction workers resident in cities, towns and villages throughout the land. The thousands of dollars spent for construction projects, and the millions of dollars of wealth that they produce, must be more fully recognized. Additional emphasis must be given to the dominant part that highway and building construction, maintenance and operation, as well as highway transportation, play in the life of the citizens of the nation.

Thus, it can be realized there is much for combined Congress consideration, and surely the Congress deliberations cannot fail to impress the public of the importance of highway and building activities and their influence upon the economic and social welfare of the country. Progress toward these ends will measure the success of the combined Congress in accomplishing its objectives.

### *Equipment and Material Exhibits*

Two exhibits of equipment and materials will feature the Congress. One embracing highway and building construction and maintenance equipment and materials will be staged in the Municipal Airport building, and the other, presenting equipment and materials of special interest to material producing groups, will occupy space in the Book Cadillac hotel.

Being located in Detroit, a manufacturing center itself and convenient to others, there is little doubt that both exhibits will attract a record number of exhibitors who will wish to take advantage of the opportunity for such extensive contacts among users of highway and building equipment and materials.

The general display is expected to surpass all previous similar exhibitions in both size and character, reflecting the broad scope of those in attendance at the Congress.

### *Summary of Congress Advantages*

The entire Congress will be impressive in the number of national associations taking part, delegates in attendance, and the size and character of the exhibits. It will be a significant event in that it will bring together for the first time in joint effort and meeting the varied allied interests of highway and building construction. It will make possible an interchange of ideas between engineers, architects, contractors, manufacturers, producers, officials and others interested in public and private highway and building construction at a critical time in the economic affairs of the entire construction industry. The accompanying exhibitions which will feature highway and building equipment, materials and methods, will have an enlarged scope in comparison with previous similar exhibitions. All in all it promises the most satisfactory means of developing the strength of the united highway and building interests with maximum economy for the associations, delegates and exhibitors participating.

Finally, the combined attendance will emphasize the strength of the united construction forces and focus attention upon the far-reaching influence of construction activity. Results will be the development of a coordinated program for sound progress by the individual associations, and additional impetus to educational measures which will sustain public interest and justify the expenditures for highway and building improvement throughout the world.

### *Participating Associations*

Already 14 associations have joined in the plans for the Congress, and others are expected to be added to this number. A list of the associations enrolled to date follows:

Construction League of the United States.
American Road Builders' Association.
Associated General Contractors of America.
Truck Association Executives of America.
The Asphalt Institute.
Associated Equipment Distributors.
National Crushed Stone Association.
National Paving Brick Association.
National Ready Mixed Concrete Association.
National Sand and Gravel Association.
Portland Cement Association.
American Society of Municipal Engineers.
American Institute of Steel Construction.
Steel Founders Society of America, Inc.

## Lowers Tariff on Cement and Rock Crushing Machinery

REDUCTIONS in varying amounts in the duty on cement manufacturing and on crushing machinery has been ordered by the Australian government. The reductions are effective at once, operative provisionally and subject to parliamentary approval.

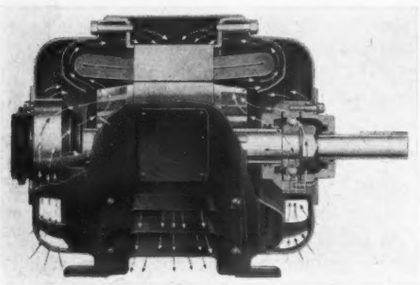
## Safety Rule Book

A BOOK of safety rules, well illustrated, has been published by the National Safety Council. This booklet, "Safety Pays," has been prepared so that any company may issue it as its own book of rules. Companies who wish to distribute copies to their employes may obtain copies from the Safety Council at a small charge.

# New Machinery and Equipment

## Splash-Proof Induction Motors

A NEW LINE of splash-proof induction motors is announced by the General Electric Co., Schenectady, N. Y. These motors are designed particularly for applications in which open-motor operation is handicapped by the presence of splashing or dripping liquids.



***Dripping liquids do not harm***

The motor frame is protected against the entrance of dripping water and liquids by a one-piece cover, which is fitted to the motor frame. The ventilating air, which enters through the end shield openings, is circulated over the end windings, across the motor frame, and out through louvres in the protective cover.

A water-tight conduit box protects the motor leaders against damage by dripping or splashing water.

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## Light-Weight Shovel

THE Bucyrus-Erie Co., South Milwaukee, Wis., announces a new ½-yd. excavator to be known as the 16-B. Its weight is under 30,000 lb. and its 6-cylinder gasoline engine develops 54 hp. The digging ability, strength and light weight of this machine has been brought about by a complete new design, the manufacturer states. Among the features claimed for this machine are: Conical swing rollers rolling between two roller paths eliminating center pintle and center pintle adjustment; elimination of dead-weight; no dead counterweight; chain-crowd with high-speed retraction; unit assembly; single-shaft-drive mounting; climbs grades of 30% easily; all clutches interchangeable; all welded box-girder boom and outside sticks; a very efficient digging and free-dumping inserted-tooth dipper; great horsepower per pound of weight. Choice of gasoline, Diesel or electric power is available. High speed independent boom-hoist and two speed transmission are standard. The machine is convertible—shovel, dragline, clamshell, crane, drag-shovel or skimmer scoop.


***Complete new design reduces weight***

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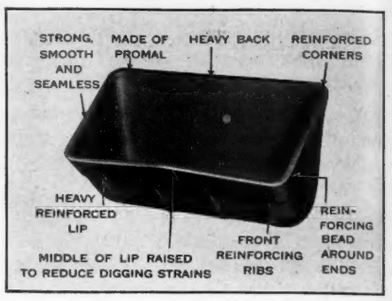
## Elevator Bucket

A NEW DESIGN of elevator bucket for heavy-duty work is announced by the Link-Belt Co., Indianapolis, Ind.

The new bucket, to be known as Style "AAP," is made in all the popular sizes, such as 8x5, 10x6, 12x7, 14x7, 16x8 and 18x8, and its principal features are summarized as follows: (1) Heavy back, (2) heavy lip; (3) reinforced corners, (4) front reinforcing ribs, (5) reinforcing bead around ends, (6) middle of lip raised to reduce digging strain, and (7) made of promal.

It is claimed that the new bucket, while weighing and costing a trifle more, will result in economies through its longer life, accruing from a distribution of metal which insures the maximum in wear resistance and endurance.




***For heavy duty elevating***

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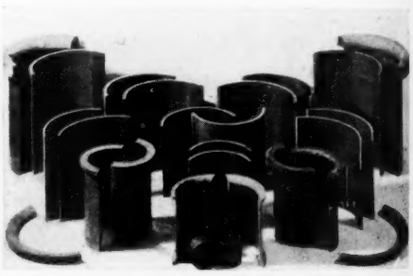
## Features New Bearing

JOSEPH T. RYERSON AND SON, Inc., Chicago, Ill., announces a new bearing made from synthetic resin similar to Bakelite and with textile material as the base. The belting textile material reinforces the resinoid, which is said to completely fill and saturate it. According to the manufacturer, the bearing is not fusible or soluble, cannot be resoftened by heat, will not absorb water or oil and is resistant to most acids. It is, however, attacked by hot caustic alkalies.



***Synthetic resin lubricated with water***

Actual service tests have shown that "Ryertex" bearings will outlast babbitt and bronze applications from four to ten times, the manufacturer states. They are particularly adaptable where it is easier to apply water as a lubricant than oil.

In the case of rolling mills of different kinds and other special applications, the greater hardness of the bearing permits the roller to hold his section better, as the wear is much slower.

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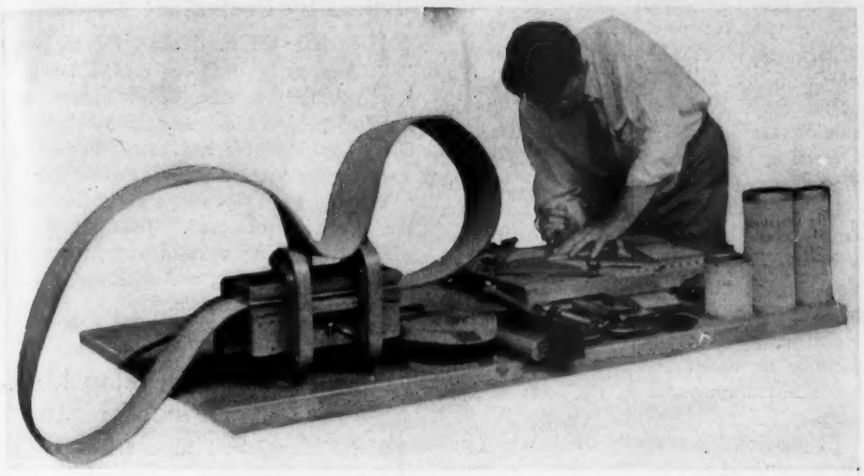
## Improves Belt

A RUBBER BELT and equipment to enable endless belts to be made at the point of installation is announced by the B. F. Goodrich Co., Akron, Ohio. This new belt,



***Making endless rubber belt in the plant***

"Highflex Junior," is made in widths up to 6 in. of a specially woven fabric designed to give the characteristics necessary when transmission belting is to be spliced endless right on the machine. Electrically heated, automatically controlled portable electric vulcanizers for making the splice have been developed by the James C. Heintz Co., Cleveland, Ohio. A light template for laying out and stepping down the ends of the belt so a perfect fit can be obtained, along with the necessary hand tools, complete the equipment necessary.

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## Converts Dredge to Electric Power

THE SUCTION DREDGE *Middlesex*, of the Trimount Dredging Co., was originally operated by steam and still retains one oil-burning boiler for heating purposes and for supplying a double horizontal reciprocating steam engine which operates the winding machinery. To change the cutter head and the dredge pump from steam to electric power with a minimum of alteration and expense, to obtain economical operation required much study. The method finally adopted is described in the following:

The dredge pump has a 17-in. suction and a 15-in. discharge and requires a 500-hp. variable-speed motor of 500 r.p.m. maximum speed. For the cutter head, which runs at a maximum speed of 25 r.p.m., a 300-hp. variable speed motor of 1750 r.p.m. maximum speed is used, necessitating speed reducers between the motor shaft and the main shaft upon which the cutter head is mounted.

The reduction is made in two steps, the first being accomplished by a De Laval worm gear of 13¼ to 1 ratio, which is shown as installed on the ladder of the dredge. As the ladder is operated at various angles, from the horizontal up to an inclination of 45 deg., a forced feed lubricating system is employed, consisting of a gear pump at one end of the worm shaft, connected to draw oil from the bottom of the case and deliver it to each of the plain sleeve bearings of the worm gear shafts and to the worm and gear tooth surfaces, also to a Kingsbury bearing which takes the thrust of the worm.

The bedplate supporting the motor, the worm drive and the bearing stands, both fore and aft of the spur gears, is of welded construction and is slipped between, and riveted and welded to, the side girders of the ladder.

The ladder, with the cutting machinery, measures 60 ft. 8 in. from the hinge pin to the end of the cutter. It replaces one of much lighter construction and is partly supported when in the water by a pontoon tank measuring 17 ft. 6 in. by 14 ft. by 6 ft. deep, which is secured to the under side of the ladder hinges and stands with its top approximately at water level when the cutter machinery is in a horizontal position. The joint between the ladder suction pipe and the hull pipe is a water-serviced swivel elbow.

The dredging machinery of the *Middlesex* was designed and built by the Norbom Engineering Co., Darby, Penn.

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## Salesmen Take Blasting Information Examinations

AN EDUCATIONAL PROGRAM for the explosives service men and salesmen of Hercules Powder Co., Wilmington, Del., has been introduced by the company's explosives technical-service division. While all sales and service men are carefully trained originally, the course is designed to keep their technical knowledge fresh in mind and up-to-date.

Hercules explosives and blasting supplies, their properties and application are the subject of these periodic examinations being given the salesmen by means of questionnaires.

All Hercules service men and salesmen are required to answer each set of questions sent out and each man is informed of his comparative rating.

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## Helmet for Dust Protection

A HELMET to provide complete protection to workers against the inhalation of injurious dusts, vapors, etc., is announced by the W. W. Sly Manufacturing Co., Cleveland, Ohio.

It is light in weight and designed so that its weight is carried largely by the shoulders. It is adjustable for different operators, comfortable and roomy, the manufacturer states. A "Purair" blower unit has been designed to furnish clean, dry air to the helmet. The helmet may also be attached to a compressed air line by using a Sly filter and purifier.

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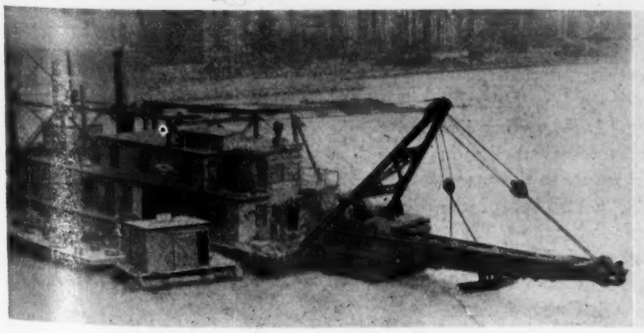
## Takes Over C. G. Buchanan Co.

THE Birdsboro Steel Foundry and Machine Co., Birdsboro, Penn., announces it has taken over full ownership and direct management of the C. G. Buchanan Co., New York, N. Y., effective September 7. The company will continue the manufacture and sale of new equipment and is prepared to supply repairs for crushing equipment. George H. Keppel will be in charge of the New York office.



***Pontoon tank helps support ladder***


***Worm gear reducer at cutter head drive***

## Applications for Nearly a Billion of R. F. C. Construction Loans

THE Reconstruction Finance Corp. has received 243 applications for self-liquidating construction loans totaling $807,355,677 during the past two months.

The total estimated construction costs of these projects is approximately $4,000,000,000.

The projects would provide direct work for more than 1,000,000 men, and 3,000,000 men indirectly for one year, according to American Federation of Labor statistics.

The requests for federal aid come from practically every state in the nation.

Congress has authorized the corporation to loan $1,500,000,000 or more for this type of construction.

To date the corporation has granted three self-liquidating loans: $40,000,000 to the Metropolitan Water District of Southern California, $13,000,000 to construct a bridge across the Mississippi river near New Orleans and $105,000 to the city of Madison, S. D., to enlarge its municipal light and power plant.

### *Many for Small Projects*

Many of the recent requests for loans are for small projects of the type looked upon with favor by the corporation.

"We are anxious to authorize loans on small projects, since these provide work for large numbers of men and spread employment in all sections of the country," Harvey C. Couch, director, said.

Orders to hurry preliminary work on the applications have been given to legal and engineering departments by the board of directors.

The rate of interest charged on self-liquidating loans has not been definitely decided upon, although a general rate of 5% usually is required.

Formal applications presented to the corporation include: 107 water supply works, $292,382,000; 27 bridges, $211,000,000; 33 irrigation systems, $98,000,000; 4 slum rehabilitation projects, $59,000,000; 3 airports, $7,192,000; 2 tunnels, $115,000,000; 1 ferry, $3,500,000.

Bond issues probably will form security for most of the loans granted.—*Wall Street Journal* (New York City).

## Contractors Would Pay for Construction Materials With Trade Acceptances

NOTORIOUS CREDIT ABUSES within the construction industry, which have long worked to the competitive disadvantage of responsible general contractors, may soon be successfully curbed by general adoption of a proposal to be considered by the governing board of the Associated General Contractors of America, at its fall meeting in Washington, D. C., October 10 and 11, Edward J. Harding, managing director, announces.

The proposal, which is based upon a recent general recommendation of the finance department of the United States Chamber of Commerce, is to substitute the trade acceptance for the open-book account in the sale of materials and supplies to contractors.

Pointing out that, under the widespread abuses of the open account system, responsible contractors who pay their bills are to a large extent being required to finance their irresponsible competitors, Mr. Harding says that he believes that this injustice eventually might be eliminated by having each transaction between the contractor and the manufacturer or dealer represented by a negotiable instrument such as the trade acceptance.

In practice, the maturity of the trade acceptance would be approximately that of the open account for which it would be substituted, but it would result, in most instances, in transferring the financing of the transaction from the seller to the banking system, where it rightfully belongs, Mr. Harding states. Leniency in the matter of defaulted acceptances would leave the manufacturer or dealer without recourse and should go far toward discouraging the extension of credit to irresponsible contractors, he believes.

## Produce Agricultural Limestone at New Iowa Quarry

EARL and Asa Charbonneau of Oakville, Ia., have installed a pulverizer and started to grind limestone on their farm.

The stone has been inspected by geologists and received some favorable comments on its high calcium content.

The Charbonneau brothers hope to build an important quarry at their farm.—*Burlington* (Ia.) *Hawkeye.*

## Fire Destroys Kaweah Quarries Plant

A $100,000 FIRE completely destroyed the Kaweah Quarries plant near Lemon Cove, Calif., on September 9.

The fire destroyed three storage houses filled with the finished lime products, the grinding equipment and other machinery and the railroad cars owned by the quarry.

A. C. Root, proprietor of the plant, was in San Francisco when notified of the fire.—*Exeter* (Calif.) *Sun.*

## H. M. Rigg

H. M. RIGG, 33, operating superintendent of the Acme Limestone Co., Alderson, W. Va., died September 18. Mr. Rigg had been with the company 16 years, starting in as payroll clerk and working up to the superintendency. He was also a member of the board of directors of the company.

Mr. Rigg was a brother of J. A. Rigg, general manager of the Acme company and a director of the National Crushed Stone Association.

## Killed by Premature Explosion

HURLED 120 ft. through the air when 40 sticks of dynamite exploded prematurely, Archie Webster, 28, met instant death September 13 in a quarry near McMinnville, Ore. Mr. Webster had been working two weeks in the quarry, in charge of loading the holes. He was preparing a 16-ft. hole when the explosion occurred. John Mikkelsen, who was working next to him, was partly blinded by flying dirt and rocks. Cause of the explosion is unknown.

## Kelley Island to Develop Limestone Deposit in Michigan

THE Kelley Island Lime and Transport Co., Cleveland, Ohio, has acquired a lease on 8000 acres of limestone deposits at Rockport, Mich., north of Alpena, which the company plans to develop on a large scale.—*Manufacturer and Financial Record.*

## Slag Association Moves

THE National Slag Association is moving its offices to Room 1449 in the Leader Bldg,. Cleveland, Ohio, H. J. Love, manager, announces. It will be located at this new address October 10.

OWNERSHIP OF ROCK PRODUCTS

Statement of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of ROCK PRODUCTS, published every second Saturday at 542 South Dearborn street, Chicago, Ill., for October 1, 1932.

State of Illinois, County of Cook, ss.

Before me a notary public in and for the state and county aforesaid, personally appeared Nathan C. Rockwood, who, having been duly sworn according to law, deposes and says that he is the business manager of ROCK PRODUCTS, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Tradepress Publishing Corp.; Editor, Nathan C. Rockwood; Managing Editor, None; Business Manager, Nathan C. Rockwood.

2. That the owner is Tradepress Publishing Corp., Chicago, Ill., and that the stockholders holding 1% or more of the total amount of stock are: W. D. Callender Estate, Nathan C. Rockwood, both of 542 South Dearborn street, Chicago, Ill.

3. That there are no bondholders, mortgagees, or other security holders owning or holding 1% or more of total amount of bonds, mortgages or other securities.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct, or indirect, in the said stock, bonds, or other securities, than as so stated by him.

NATHAN C. ROCKWOOD,
Business Manager.

Sworn to and subscribed before me this 28th day of September, 1932.

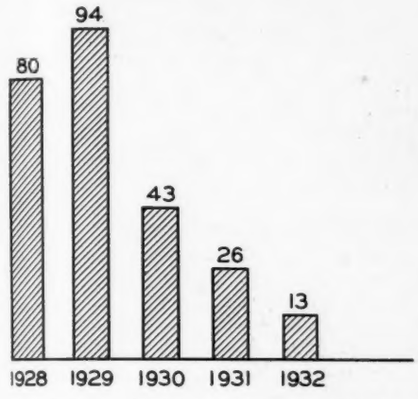
(SEAL) FRANK A. KUNTZ.
(My commission expires September 15, 1936.)

## Cement Mill Accidents During August

THE AUGUST accident record of the mills and quarries within the membership of the Portland Cement Association showed a marked reduction of accidents as compared with previous August records.

There were 13 lost-time and no fatal accidents, as compared with 12 lost-time and no fatal accidents for July and 24 lost-time and two fatal accidents for August, 1931.

One of the lost time accidents which occurred in August resulted in the loss of




***August accidents in cement industry***

the sight of one eye to a track foreman who was hit in the eye by a fragment of steel which chipped off a maul as he was attempting to pull a bolt out of a track bar.

### *Beware of Flue Dust*

A boiler house laborer was pulling dust out of flues when the blocks on which he was standing fell from under him, throwing him into a pile of hot dust. Severe burns on his left foot and right hand resulted in 14 days lost time.

As the above report is the fifth received by the association in the last two months on the subject of hot dust burns, an investigation was made of these accidents, with a view to obtaining some information which would be of value to the industry. We quote from operating officials of two of the interested companies:

"At some of our plants we have a sheet iron shield varying in height from 1 to 2 ft. with the ends bent at a 45 deg. angle which the men can move from place to place and put on the side of the conveyor on which they are standing and pulling at the dust which runs very easily. This should prevent the dust from running all over the floor and having them tread in it. We find that this protection is of considerable help."

Another writes:

"Some of the factors or conditions are recounted herewith, and should be regarded as dangerous:

"(1) Excessive accumulation of hot material above clean-out doors which may 'flood.'

"(2) Position of laborers with respect to location of clean-out doors may be such that escape may be cut off in case of 'flooding.'

"(3) Insecure footings for men engaged in clean-out operations are always hazardous, but especially when there is hot material underneath.

"(4) Material in dust chambers may bridge or arch over the door so that when punctured a sudden rush of hot material through the door may result.

"(5) The presence of wet or damp material along with hot dust constitutes a bad hazard, as for example: when back spills or slurry occur in dust chambers of wet process kilns. This condition is believed to have resulted in a steam explosion and is held responsible for the accident causing a fatality and critical injuries to another employe this year.

"(6) Employment of inexperienced men in any clean-out operations involving the handling of hot materials should be avoided.

"(7) Wetting down of hot material within restricted spaces is unsafe.

"(8) Where there is a possibility of unburned coal present in dust chambers, clean-out doors should be opened cautiously by means of a bar if possible."

## Announces 1933 Meeting of A. S. T. M.

THE ANNUAL MEETING of the American Society for Testing Materials in 1933 will be held in Chicago, June 26-30, C. L. Warwick, secretary-treasurer, announces.

## Recent Prices Bid and Contracts Awarded

*Lincoln, Neb.* Graveling a 15-mi. detour at Milford, which will require 3930 cu. yd. of gravel, has been let at $1.48 per yd. Contract has also been awarded for graveling a detour near Cortland to require 3373 cu. yd. at $1.59 per yd.

*Richmond, Va.* Advancing prices of cement and other materials are causing the state highway commission to purchase a year's supply. Bids for 100,000 bbl. for the present fiscal year total approximately $230,000.

*San Francisco, Calif.* Following rejection of all bids for supplying cement for tunnels at the Hetch Hetchy dam, arrangements were made to buy the cement in the open market directly from the various mills. Freight rate reductions will result in a saving of 15 c. per bbl.

*Guthrie Center, Ia.* Kaser Construction Co. of Adel has been awarded contract for placing 6786 cu. yd. of Class B gravel at $1.14 per yd., said to be a very low price, considering the distance of hauling.

*Geneva, Ohio.* Standard Slag Co., Youngstown, will furnish 2200 tons of slag to the county commissioners at $1.84 per ton in place.

*Portsmouth, Ohio.* The city has purchased 300 cu. yd. of gravel and 200 cu. yd. of sand at $1.25 per yd. from the Portsmouth Sand and Gravel Co., the only bidder.

*Denver, Colo.* The United States Reclamation Service on September 26 found the bid of $480,000 for 400,000 bbl. of cement, presented by the Cowell Lime and Cement Co., San Francisco, low. A joint bid for the same job was $496,000, submitted by the Riverside Cement Co., the California Portland Cement Co., the Southwestern Portland Cement Co. and the Monolith Portland Cement Co. Other bids were: The Pacific Portland Cement Co., $640,000, the Santa Cruz Portland Cement Co., $700,000. The Utah-Idaho Cement Co. bid $151,200 for 140,000 bbl. and the Union Portland Cement Co. $70,200 for 65,500 bbl.

RETAIL MATERIAL PRICES, DELIVERED, SEPTEMBER 1, 1932 (COMPILED BY DEPARTMENT OF COMMERCE)

| City | Portland cement, per bbl. exclu. of cont. | Gypsum wallboard, ⅜-in., per M | Hydrated lime, per ton | Building sand, per cu. yd. | Crushed stone, ¾-in., per ton | Gypsum plaster, neat, per ton |
|---|---|---|---|---|---|---|
| New Haven, Conn. | $2.40 | ..... | $25.00 | $1.25 | $2.00 | ..... |
| New London, Conn. | 2.40 | $25.00 | 18.00 | 1.00 | 2.00 | 18.00 |
| Haverhill, Mass. | 2.60 | 25.00 | 16.00 | ..... | ..... | 19.00 |
| New Bedford, Mass. | 2.40 | 25.00 | 16.00 | 1.25 | 2.50 | 16.00 |
| Albany, N. Y. | 2.70 | 23.85 | 15.75 | ..... | ..... | 16.20 |
| Buffalo, N. Y. | 2.95 | 21.00 | 18.00 | 2.50 | 2.05 | 16.00 |
| Poughkeepsie, N. Y. | 2.00 | ..... | 18.00 | 1.25 | 2.20 | ..... |
| Rochester, N. Y. | 2.28 | 22.00 | 14.50 | 2.00 | 2.40 | 16.00 |
| Syracuse, N. Y. | 2.60 | 20.00 | ..... | 1.80 | 1.50 | 14.00 |
| Paterson, N. J. | 2.00 | 24.00 | 18.00 | 1.50 | 2.10 | 17.50 |
| Trenton, N. J. | 2.10 | 28.00 | 13.50 | 1.60 | 1.50 | 15.25 |
| Philadelphia, Penn. | 2.24 | ..... | 12.50 | 1.65 | 2.40 | 15.00 |
| Scranton, Penn. | 2.40 | 30.00 | 18.00 | ..... | ..... | 18.00 |
| Baltimore, Md. | 2.10 | 25.00 | 13.00 | 1.85 | 2.50 | 15.00 |
| Washington, D. C. | 2.10 | 22.00 | 11.00 | ..... | ..... | 13.00 |
| Richmond, Va. | 2.80 | 38.00 | 20.00 | 1.50 | 2.25 | 18.00 |
| Fairmont, W. Va. | 2.50 | 35.00 | 16.00 | 2.50 | 3.25 | 17.75 |
| Atlanta, Ga. | 2.75 | ..... | ..... | 3.38 | 2.75 | ..... |
| Tampa, Fla. | 3.00 | 50.00 | 24.00 | 3.25 | 2.80 | 20.00 |
| New Orleans, La. | 2.35 | 37.00 | 14.00 | 2.00 | ..... | 18.00 |
| Shreveport, La. | 3.00 | 40.00 | 18.00 | 1.50 | 3.50 | 20.00 |

| City | Portland cement, per bbl. exclu. of cont. | Gypsum wallboard, ⅜-in. per M. | Hydrated lime, per ton | Building sand, per cu. yd. | Crushed stone, ¾-in., per ton | Gypsum plaster, neat, per ton |
|---|---|---|---|---|---|---|
| Akron, Ohio | $1.81 | $40.00 | $14.00 | $1.50 | $2.50 | $15.50 |
| Cleveland, Ohio | 1.80 | 21.00 | 12.00 | 2.03 | 2.20 | 18.00 |
| Columbus, Ohio | 2.00 | ..... | 14.00 | 1.22 | ..... | 16.00 |
| Toledo, Ohio | 1.92 | 21.00 | 14.00 | 1.75 | 2.25 | 14.00 |
| Detroit, Mich. | 2.00 | 25.00 | 12.00 | 2.03 | 1.75 | 13.00 |
| Lansing, Mich. | 2.25 | ..... | 20.00 | 1.80 | 1.80 | 17.50 |
| Saginaw, Mich. | 1.88 | 20.00 | 17.00 | 2.50 | 2.20 | 17.50 |
| Terre Haute, Ind. | 2.20 | 28.00 | 18.00 | 1.25 | 3.00 | 18.00 |
| Chicago, Ill. | 1.95 | 22.00 | 15.00 | 2.15 | 1.80 | 16.00 |
| Louisville, Ky. | 1.86 | 45.00 | 15.00 | 2.00 | 2.15 | 17.00 |
| Milwaukee, Wis. | 1.88 | 22.00 | 14.00 | 1.25 | 1.25 | 15.20 |
| Des Moines, Iowa | 1.82 | ..... | ..... | ..... | ..... | 14.00 |
| Kansas City, Mo. | 2.20 | 25.00 | 22.00 | 1.82 | 1.88 | 17.00 |
| St. Paul, Minn. | 2.10 | 23.00 | 19.00 | 1.25 | 1.75 | 17.00 |
| Grand Forks, N. D. | 3.00 | 23.00 | 19.00 | 1.25 | 1.75 | 17.00 |
| Sioux Falls, S. D. | 2.00 | 22.00 | 20.00 | 1.25 | 1.75 | 15.50 |
| Wichita, Kans. | 2.15 | 25.00 | 22.50 | 1.00 | ..... | 15.50 |
| San Antonio, Tex. | 2.55 | 39.00 | 20.00 | 1.75 | 2.00 | 18.15 |
| Tucson, Ariz. | 3.29 | 45.00 | 28.80 | 1.25 | 2.25 | 17.10 |
| Los Angeles, Calif. | 2.30 | 23.50 | 24.70 | 1.25 | 1.40 | 16.50 |
| San Francisco, Calif. | 2.65 | 45.00 | 21.50 | 1.40 | 1.60 | 17.30 |
| Seattle, Wash. | 2.75 | ..... | ..... | ..... | ..... | ..... |

# THE INDUSTRY

## Incorporations

**Waterways Stone Co.**, Princeton, Ky., $10,000. W. C. Sparks and H. E. Rodes.

**T. D. Spruce Natural Fertilizer Co.**, Hot Springs, Ark., $35,000. T. D. Spruce.

**Oak Hill Sand and Cement Products Co., Ltd.**, 219 Central Bldg., Victoria, B. C., $25,000.

**Mankato Crushed Stone Co.**, St. Paul, Minn. A. A. McGree, Fred B. Desch and Guy Chase.

**Morgan County Minerals Co.**, Knoxville, Tenn. H. M. Wimberly, Mercantile Bldg., Knoxville.

**Marion Cass Development Co.**, Beaumont, Tex., $60,000. H. A. Perlstein and S. G. Burnett.

**Mercer Sand and Gravel Co.**, Trenton, N. J.; 100 shares of no par value. Col. Stephen H. Barlow, president; Wm. A. Moore, vice-president, and Jack S. Bernstein, treasurer.

**Central Wisconsin Cooperative Warehouse Association**, Mauston, Wis. Non-stock. Roy C. Walker, Plainville; F. C. Mitchell, Wilton; Jos. F. Sterba, Hillsboro. To deal in cement, building materials, fertilizer, etc.

**Sterling Crushed Stone Co., Inc.**, Boston, Mass., $50,000; 5000 shares at $10 each and 2500 common shares of no par value. Octavius Menici, president and treasurer, 19 Martinack St., Peabody, Mass., L. E. Pekkala and I. Mackey.

## Quarries

**Auxvasse Quarry Co.**, Auxvasse, Mo., is operating its quarry two shifts per day.

**J. T. Degman** announces he is installing much new machinery in his quarry near Visalia, Calif.

**L. L. and A. B. Stevenson** are erecting a rock crushing plant in the old Sonoma rock quarry near Santa Rosa, Calif.

**Vermilion, Ohio.** The Birmingham quarry which has been closed for the past year opened recently with a force of 16 men.

**Carrollton, Mo.** Stokes township has been determined as the location for the state highway quarry to be opened in this county.

**Cassville, Mo.** It is reported that the state highway department has taken leases on three rock quarries near here. Material will be used for surfacing roads.

**Athens, Tenn.** Dr. W. J. Fitts, state commissioner of agriculture, states that a state-owned limestone crusher will be sent to McMinn county and that crushing will be done at cost for farmers.

**Moberly, Mo.** A rock quarry to give employment to about 200 unemployed men in Moberly and Randolph counties is expected to be in operation by October 15. Rock will be quarried for future use on farm-to-market roads.

**Weaver Construction Co.**, is developing a new quarry at Floyd station near Charles City, Ia. Machinery is being installed and day and night shifts will be maintained. F. Belzer, who also operates a crushing plant there, will operate his plant on a 24-hour basis also, it is reported.

## Cement

**California Portland Cement Co.** has resumed shipments which were stopped because of delay on construction from high water.

**Pacific Portland Cement Co.** recently suffered a slight loss at its Redwood City, Calif., plant, from fire attributed to hot cement in the bins.

**Pennsylvania-Dixie Cement Corp.**, announces that its Kingsport, Tenn., plant will reopen and its Valley Junction, Ia., plant will close about October 1.

**Oregon Portland Cement Co.** reopened its plant October 1 on a full time basis. After plant organization is perfected in three shifts L. C. Newlands, president of the company, said he hoped to organize it in four 6-hour shifts.

## Sand and Gravel

**Charles Carey** has opened a gravel pit near Norris, Ga.

**Lampert Construction Co.** will operate a gravel plant in Plover, Wis., for road construction on Highway 52.

**Felton Sand and Gravel Co.** is the name filed by R. M. Greathouse for his sand and gravel business at Felton, Calif.

**Eastern Ohio Sand and Gravel Co.**, East Liverpool, Ohio, recently suffered damage to its hoist house and equipment by fire.

**Pacific Coast Aggregate, Inc.**, has reopened its plant at Niles, Calif., after having been closed for several months and is operating at capacity.

**San Diego, Calif.** A shipment of foundry sand is being made from here to Seattle by boat. This will be used by foundries in the northwest Pacific states.

**Eau Claire Sand and Gravel Co.**, Eau Claire, Wis., and its modern facilities for producing and furnishing sand and gravel were recently featured in a news story in the *Augusta Union*.

**Michigan, Ind.** The second shipment of sand within a month has been rejected by County Engineer Alexander as not meeting county specifications. A total of 5900 tons were included in these shipments.

## Lime

**Ash Grove Lime and Portland Cement Co.** is operating kilns at its Galoway, Mo., lime plant day and night to take care of present business, Paul Sunderland, manager, reports.

**Bogalusa Paper Co., Inc.**, Bogalusa, La., is installing lime burning equipment and additional washing and pulp thickening equipment in its plant there. The United Engineers and Constructors, Inc., Philadelphia, Penn., are consulting engineers and have been working on plans for new construction.

**Wenatchee, Wash.** Marl, which is said to be 85% calcium carbonate, is being tried as fertilizer by a number of orchardists in Okanogan county. H. B. Richardson and W. E. Stevens of Wenatchee and Grover Fore of Okanogan have acquired a number of deposits and plan to market the material.

## Gypsum

**Pacific Portland Cement Co.**, San Francisco, Calif., announces an improvement in its leading brand of gypsum plaster, "Empire Fibred Hardwall," which has given better spreading qualities to the plaster. J. A. McCarthy, vice-president, said that the goal of the concern's research laboratories for years has been "easy application without sacrificing results" and that the new plaster attains this goal.

## Other Rock Products

**Bryson City, N. C.** The first load of feldspar was shipped September 19 from the Alarka Lumber Co.'s deposits. The company plans to develop this industry within the next few months.

**Meade, Kan.** The silica industry in this vicinity is showing considerable activity. Several leases, some of which are to be developed at once, have been signed by outside producers.

**Southern Appalachian Mineral Society** recently was addressed by Dr. Frank L. Hess, principal mineralogist of the United States Bureau of Mines on the subject of "Pegmatites" at a meeting in Spruce Pine, N. C. Five states were represented in the attendance.

**Skagit talc mine** on the Skagit river near Bacon creek, Wash., has recently supplied talc bricks for lining stoves and furnaces to a Portland manufacturer. It is said the Skagit bricks are superior to those from Virginia which have been used previously. The deposits of pure talc at this mine are said to be large. The company expects to install a talc mill and grinding equipment soon.

## Personals

**Harvey LeFevre**, formerly sales manager of the H. K. Porter Co., has joined the forces of the Heisler Locomotive Works, Erie, Penn.

**W. H. George**, manager of the Cowell Portland Cement Co., Cowell, Calif., was recently host to building material dealers at a dinner there.

**H. E. Reeder** of the Alpha Portland Cement Co. recently addressed the New Philadelphia, Ohio, Rotary Club at its weekly meeting on "The Manufacture and Distribution of Cement."

**John Calvin Shumberger**, controller of the Lehigh Portland Cement Co., recently addressed the annual meeting of the Controllers' Institute of America on "Responsibilities and Rank of the Controller."

**E. W. Rice**, chief chemist of the Santa Cruz Portland Cement Co., Davenport, Calif., has been appointed a member of the Sugar Chemistry Division of the American Chemical Society for 1932-1933.

**Harry M. Urban** of the Spruce Pine Mica Co., Spruce Pine, N. C., is conducting a class in geology there. Students are men engaged in the various mining enterprises in that section who desire additional instruction in geology.

**W. S. Culver**, district engineer of the east central district of the General Electric Co., Schenectady, N. Y., with headquarters at Cleveland, retired from active duty September 30. C. W. Fick, assistant district engineer succeeds Mr. Culver as district engineer.

**H. J. Lyons**, has been added to the field organization of the Iowa territory of the Portland Cement Association with headquarters at Mason City. In announcing his appointment W. H. Steiner, district engineer, Des Moines, said, "we are increasing our field force because we feel there is need of more development of cement construction and there are indications that conditions are improving."

## Obituaries

**Frank Williams**, 45, a sand and gravel contractor of Pocatello, Ida., died from a shot fired by his wife.

**Sidney S. Emery**, 60, former chief chemist of the DuPont Powder Co. at Louviers, Colo., who resigned because of ill health sometime ago, recently killed himself in Denver.

**Harry C. James**, 64, treasurer of the Ideal Cement Co. and vice-president of the Denver National Bank, died in his summer home near Denver, September 23. Besides his interest in the Ideal Cement Co. and its subsidiaries he was interested in mining companies and was a member of a number of clubs.

## Manufacturers

**Chain Belt Co.**, Milwaukee, Wis., announces the Peden Machinery Co. has been appointed distributor for its product in the Cleveland territory.

**Rickard and Co., Inc.**, advertising agency, New York, N. Y., announces its general offices are located in the McGraw Hill Bldg., effective October 1.

**Ohio Power Shovel Co.**, Lima, Ohio, announces appointment of Allied Construction Equipment Co., St. Louis, Mo., as its dealer in Missouri and south central Illinois.

**Jeffrey Manufacturing Co.**, Columbus, Ohio, announces removal of its southwestern branch office from Houston to Dallas, Tex. T. P. Burke continues as manager.

**Raymond Bros. Impact Pulverizer Co.**, Chicago, Ill., has the contract for sulphur grinding equipment to be installed in an addition to the Gulf States Chemical Co., Inc., Harlingen, Tex.

**Foote Bros. Gear and Machine Co.**, Chicago, Ill., announces appointment of J. L. Kilroy as representative in Kentucky and of C. H. Taylor as representative in South Carolina and western North Carolina.

**S K F Industries, Inc.**, New York, N. Y., announces consolidation of the manufacturing activities of Skayef Ball Bearing Co. of Hartford with the Hess-Bright Manufacturing Co., Philadelphia, subsidiaries.

**Baldwin Locomotive Works** of Philadelphia, Penn., and subsidiary companies have been licensed by the Dardelet Threadlock Corp. to manufacture, for their own use, bolts, nuts and other products threaded with the Dardelet self-locking thread.

**Riehle Bros. Testing Machine Co.**, Philadelphia, Penn., and the Torrington Manufacturing Co., with plant at Torrington, Conn., announce a manufacturing agreement whereby machines and instruments of the former company will be built by the Torrington company.

**Hercules Powder Co., Inc.**, Wilmington, Del., announces two cooperative group insurance plans for employes of the company. The plans are underwritten by the Travelers Insurance Co. and provide for both group life insurance and for group accident and sickness insurance.

**Arthur Wright and George W. O'Keeffe** have formed an organization to operate as equipment and process engineers and to be known as Arthur Wright and Associates with offices in New York City and a branch office in Portland, Ore. Other offices will be established. They will act as general sales representatives for Filtration Engineers, Inc.

**Foote Bros. Gear and Machine Co.**, Chicago, Ill., announces that manufacturing operations of the company are now being carried on at its Curtis St. plant. It expects to have completed moving of equipment and machinery to the new location by October 1. The company also announces receipt of sub-contract for the lock and taintor gate operating machinery for Dam No. 15 on the Mississippi river at Rock Island, Ill.

**Northern Blower Co.**, Cleveland, Ohio, is making a complete installation of a dust collecting system and separating and grading equipment for various sands at the Klondike, Mo., plant of the Tavern Rock Sand Co. Contracts for complete dust collecting systems have been received from the Llanerch Quarries of Vincenzo Di Francesco at Llanerch, Penn., and for the Attapulgus Clay Co., Attapulgus, Ga., on its fuller's earth grinding machinery.

# Don't let a general idea hide IMPORTANT DETAILS

## NOTE THESE CONSTRUCTION FEATURES:

Stator with cast semi-steel skeleton frame ends of nutless, boltless and threadless construction.

Core laminations punched with clean-cut dies. Have no burrs.

Laminations evenly stacked on threadless stacking pins and locked between stator retaining plates under uniform pressure.

Core assembled so that laminations do not have to be filed or drifted to accommodate stator windings.

All stator coils formed and wound by special machinery in dust-free rooms.

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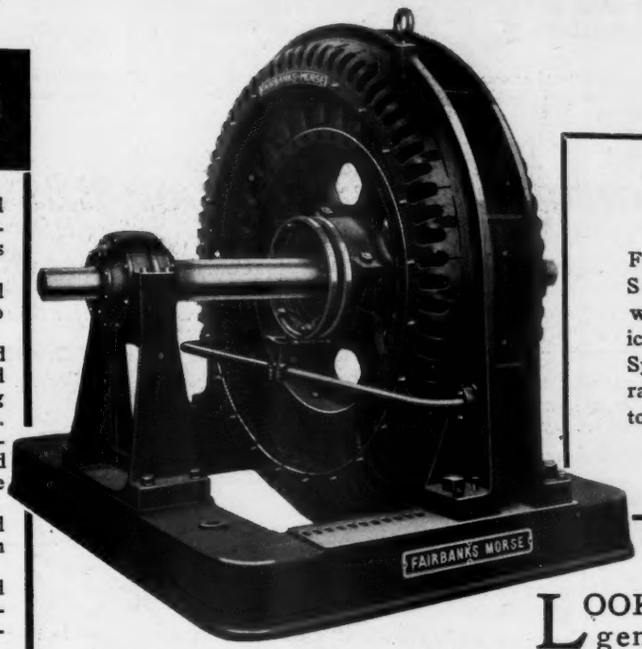
Brush mechanism mounted on heavy wrought iron pipe attached to stator frame end.

Field coils made of copper strap wound on edge by special machines.

Cast-iron collector rings entirely independent of the rotor shaft.

Liberal use of copper and iron throughout results in uniformly high efficiency.

Adequate ventilation insured by skeleton frame ends and design of interpolar connection.

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LOOK behind that broad, general term—"synchronous motors"! Certainly you are correct in believing that the basic principles behind all motors of this type are the same. But don't stop with that belief. Remember that an electric motor is a ***machine*** having electrical functions—and then take note that there is a vast difference in the way synchronous motors are designed and built—***mechanically***. For what value electrical characteristics if they are discounted by mechanical failures?

Fairbanks-Morse has recognized the need for greater mechanical perfection of synchronous motors and as a result they offer you now a complete line of synchronous motors in both high and low speed types, which offers you far more for your investment than was heretofore available. So we invite your consideration of just a few of these far-reaching improvements as shown in the column at the left. We shall also be glad to supply more complete data on how F-M Synchronous Motors are built to give a greater period of more economical service. Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.; 32 branches at your service throughout the United States.

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# Rock Products

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